R4D PROJECT:

CHALLENGES OF MUNICIPAL WASTE MANAGEMENT: LEARNING FROM POST-CRISIS INITIATIVES IN SOUTH ASIA

PROJECT WORKING PAPER #1

MUNICIPAL SOLID WASTE GOVERNANCE IN SRI LANKA: A LITERATURE REVIEW

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LIST OF ABBREVIATIONS ABBREVIATION

MoLGPC	Ministry of Local Government and Provincial Councils
MoMDE	Ministry of Mahaweli Development and Environment
MoMWD	The Ministry of Megapolis and Western Development
NSWMSC	National Solid Waste Management Support Center
CEA	Central Environmental Authority
LA	Local Authorities
PC	Provincial Councils
LLDF	Local Loan and Development Fund
SLILG	Sri Lankan Institute of Local Governance
PHI	Public Health Inspector
CPHI	Chief Public Health Inspector
MOH	Medical Officer of Health
NEA	National Environmental Act
EPC	Environmental Pollution Control
EE&A	Environmental Education and Awareness
SWM	Solid Waste Management
WWMA	Western province Solid Waste management Authority
PMMKGD	People's Movement Against the Meethotamulla, Kolonnawa Garbage Dump

1. Introduction

This literature review focuses on exploring solid waste management in Sri Lanka in relation to three key thematic areas namely; (1) the institutional architecture of waste governance (2) the waste chain and related socially differentiated labor practices, and (3) accompanying discourses on waste and waste-work in Sri Lanka.

The World Bank (WB) points out "A generation ago, many cities around the world did not have comprehensive solid waste management programmes. Organic waste was fed to animals and packaging waste hardly existed. But today, due to growing populations, rapid urbanization and economic development, managing trash has become one of the most pressing issues faced by the planet" (Ijjasz-Vasquez, 2016

Municipal Solid Waste Management (MSWM), which is a widely discussed topic in today's context, includes *the collection, transfer, resource recovery, recycling, and treatment of waste with the main target of protecting population health, promoting environmental quality, developing sustainability and providing support to economic productivity* (EPA, 2019). According to the World Bank "Municipal Solid Waste Management [MSWM] is the most important service a city provides". This highlights the significance of effective and efficient solid waste management in any given city (Ijjasz-Vasquez, 2016).

1.1. Defining Solid Waste Management

As defined by the New York State Department of Environmental Conservation [NYSDEC] (2017) 'solid waste' can be identified as *any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded materials including solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining and agricultural operations and from community activities*. These include waste tires, scrap metal, latex paints, furniture, toys, garbage appliances, vehicles oil, anti-freeze empty aerosol cans, paint cans and compressed gas cylinders' construction and demolition debris or asbestos. Further, the United States Environment Protection Agency defines 'solid waste' as wastes consisting of everyday items such as product packaging, grass clippings, furniture, clothing, bottles and cans, food scraps, newspapers, appliances, consumer electronics, and batteries. These wastes come from homes; institutions such as schools and hospitals; and commercial sources such as restaurants and small businesses. Municipal solid waste is commonly defined as garbage (food wastes, plastics, paper, glass, metals, construction debris, etc.)

thrown away by households, restaurants, shops, offices, streets and public spaces. The definition excludes excreta, biomedical, industrial and e-waste, although these will sometimes end up in the municipal waste management stream and cause additional environmental and health concerns. MSWM refers to the collection, transportation, treatment and disposal systems of waste (https://www.unescap.org/sites/default/files/CH08.PDF).

1.2. MSWM and Sri Lanka

The waste generation amount in Sri Lanka has increased from around 6,400 ton/day in 1999 (UNEP, 2001) to 10,786 ton/day since 2009 (NSWMSC, 2013). Among the nine provinces, the generation amount in the Western Province is the largest, accounting for 33% of the total generation amount in the country while that of the Uva Province occupies the smallest share (only 5%) of the country's total waste generation As for amounts of collected waste, the amount of waste collected in the Western Province is also the biggest occupying 52% of the total collected waste in Sri Lanka and those of the Uva and the North-central provinces are the smallest accounting for only 3%.

The waste collection rate in the Western Province, which includes the major metropolitan areas, is 51%, the highest among all the provinces. Collection rates and the number of final disposal sites in Sri Lanka are as follows.

Table 1: Solid waste generation in Sri Lanka – By Province

Provinces	Generation amounts (ton/day)	Collection amounts (ton/day)	Collection rates	Number of final disposal sites
1. Northern Province	566	178	31%	16
2. Eastern Province	785	347	44%	40
3. North-central Province	616	91	15%	35
4. North-western Province	1,134	187	16%	45
5. Central Province	1,585	304	19%	47
6. Sabaragamuwa Province	835	178	21%	30
7. Uva Province	587	116	20%	24
8. Western Province	3,502	1793	51%	52
9. Southern Province	1,158	264	23%	60
Total	**10,768**	**3,458**	**32%**	**349**

Source: NSWMSC, 2013

1.2.1. Waste Composition

The primary sources of MSW in the country are households, markets, commercial establishments while industries and hospitals constitute the secondary sources (AIT, 2004). MSW in Sri Lanka typically consists of a very high percentage of perishable organic material, which is about 65 – 66% by weight with moderate amounts of plastics and paper and low contents of metal and glass. The moisture content in the MSW is also very high in the range of 70 – 80% on a wet weight basis. The average calorific value is low and amounts to of around 600 – 1000 kcal/ kg.

A few studies have been done in the country to find the composition of the MSW stream in Sri Lanka. Table 1 gives the composition of MSW in some selected cities in Sri Lanka. Here, organic waste is categorized into long-term biodegradable (constituting waste that takes 2-3 months for degradation- ex: green waste materials such as tree cuttings, coconut shells/husks, leaves etc.) and short term biodegradable (constituting waste that degrades within 2 months- ex: food waste etc.).

Table 2: MSW composition in some selected cities of Sri Lanka

Cities	Biodegradable (Short Term)	Biodegradable (Long Term)	Plastics	Metal	Wood	Glass	Paper
Batticalo	46.79%	10.61%	8.26%	2.90%	17.12%	2.20%	16.45%
Colombo	68.15%	11.63%	6.69%	1.85%	5.02%	1.64%	5.99%
Galle	41.76%	20.25%	8.23%	4.79%	11.18%	4.33%	9.41%
Jaffna	54.85%	8.62%	7.21%	8.49%	5.58%	2.21%	12.80%
Kandy	54.83%	17.95%	4.02%	4.46%	6.36%	5.35%	11.08%
Matara	56.81%	18.60%	6.90%	3.07%	5.78%	2.07%	8.50%
Nuwara Eliya	60.53%	9.73%	8.46%	2.12%	8.92%	2.90%	8.72%
Polonnaruwa	35.52%	25.10%	8.47%	3.57%	7.63%	3.68%	16.04%
Trincomalee	27.98%	20.06%	4.33%	12.51%	22.04%	1.85%	18.04%

Source: AIT, 2004

2. The institutional architecture of waste governance in Sri Lanka

2.1. The waste governance structure of Sri Lanka – National Level

2.1.1. Current context

Sri Lanka uses a centralized approach to solid waste management. This approach is said to be in line with environmental sustainability and international development scholars who state that localized governance and decision-making is not necessarily the solution to achieve social justice and environmental sustainability (Purcell & Brown, 2005). However, Landstrom (2006, p.2) who has researched coastal governance in Sri Lanka, states that "*the degree to which coastal communities have gained any degree of influence with respect to the management of coastal land and resources remains questionable"* With such existing debates and inconsistencies, a number of scholars agree on the need for a more involved central government, or the need for centralization (Owens & Zimmerman, 2013) highlighting the need for a more efficient and active role that should be played by such stake holders.

Various Central government agencies are functional in Sri Lanka related to laws and administration of waste management such as, the Ministry of Local Government and Provincial Councils (MoLGPC) responsible for the local government and the Ministry of Mahaweli Development and Environment (MoMDE) which provide leading administrative guidance from the perspective of environmental protection.

Other institutions include the Ministry of Megapolis and Western Development (MoMWD) responsible for planning of megapolis development, and the Ministry of Health, Nutrition and Indigenous Medicine (MoH) which provide administrative guidance from the perspective of health and sanitation.

In addition, agencies like the National Solid Waste Management Support Center (NSWMSC) and the Central Environmental Authority (CEA) are affiliated to the MoLGPC and MoMDE respectively. The following is a compilation of the duties and jurisdiction of each institution

2.2. Agencies related to solid waste management in Sri Lanka: National Level

There are several government agencies responsible for the management of Solid Waste at national level and these organizations range from Ministries to authorities.

2.2.1. Ministry of Local Government and Provincial Councils (MoLGPC)

The Ministry of Local Government and Provincial Councils (MoLGPC) is responsible for the implementation of policies and plans for Local Authorities (LA) through the nine Provincial Councils (PC). In addition, it is responsible for the coordination between the central government and PCs, supporting the formulation and implementation of the national policy related to PCs and LAs, financial and technical assistance, assistance for human resources development and research for good governance. Other institutions functioning under this ministry such as the Local Loan and Development Fund (LLDF) is responsible for funding Las. Further, the Sri Lankan Institute of Local Governance (SLILG) is responsible for administrative capacity building and research for LAs.

2.2.2. Ministry of Mahaweli Development and Environment (MoMDE)

This ministry formulates a national policy in relation to waste management. In 1998, a Sri Lankan municipal waste database was compiled with revisions made in the year 2005. In the preparation of the database, the ministry has utilized waste generation and waste composition surveys to allow LAs to understand the importance of recycling, the significance of proper waste collection, intermediate treatment, and final disposal.

2.2.3. Ministry of Megapolis and Western Development (MoMWD)

The Cabinet of Sri Lanka following the elections in August 2015 appointed the MoMWD. The ministry is entrusted with the responsibility of discovering solutions to resolve garbage issues, housing problems of shanty dwellers and drawing new traffic plans to avoid traffic jams in busy towns. When discussing its importance in SWM, since each LA is responsible for managing regional activities by legislations, the ministry is not directly involved. However, it is responsible for assisting LAs with various improvements of SWM. On the other hand, since there are many projects related to SWM, which are organized by individual ministries and organizations, there was a need for a mechanism for overall management of these activities. Therefore, the ministry as a decision-making organization in accordance with SWM established the Committee of Secretaries, which consists of the following secretaries.

- Ministry of Megapolis and Western Development (MoMWD)
- Ministry of Provincial Councils and Local Government (MoLGPC)
- Ministry of Water Supply and City Planning (MoWSCP)
- Sri Lanka Land Reclamation and Development Corporation （SLLRDC）
- Provincial Council of Western Province (Chief Secretary of the province)

- Ministry of Mahaweli Development and Environment (MoMDE)

They collectively manage the activities of individual institutions that work individually and all SWM projects require approval from the committee prior to implementation.

2.2.4. Ministry of Health, Nutrition and Indigenous Medicine (MoH)

The MoH has jurisdiction over the making, monitoring and management of medical waste and has formulated the Healthcare Waste Management National Policy to encourage proper disposal of medical waste. The policy was developed with the aim of "providing evidence-based recommendation to clinicians and other categories of staff to manage hospital generated waste with minimum harm to the environment" (Healthcare Waste Management National Policy, 2001).

Among the duties assigned to them is dispatching a Public Health Inspector (PHI) to all cities and towns and some villages and allocating a post-called 'Chief PHI' (CPHI) to a senior PHI who is in charge of supervision and management of PHIs. The Divisional Secretary's Division has jurisdiction over the Medical Officer of Health (MOH), and work together with the PHI to maintain the National Solid Waste Management Support Center (NSWMSC).

The MoLGPC established the NSWMSC in 2007 in order to assist LAs to improve the solid waste management problem. The staffs consist of 15 officers (1 Director, 3 Assistant Directors, 10 Development Officers, and 1 Management Assistant) in total with the following key duties fulfilled by them.

- To provide a variety of manuals and guidelines to facilitate LAs to implement proper SWM.
- To provide technical assistance on solid waste management to LAs.
- To collect and study information on the current SWM practices and the practices in LAs, as well as those in foreign countries. The NSWMSC then provides this useful information to LAs.
- To facilitate LAs to get technical and financial assistance from NGOs and donors.
- To promote, evaluate, and make recommendations to the National Strategy for Solid Waste Management.
- To collect and analyze the waste management data of LAs.

2.2.5. Central Environmental Authority (CEA)

As a manifestation of its policy perspective of the integration of environmental conservation with development, the Parliament through the National Environmental Act (NEA) No. 47 of 1980, established the CEA in the same year as it established the premier State institution

for the protection and management of the environment. The Central Environmental Authority is a corporate authority with executive functions in the field of environmental management. The aim of CEA is "establishing a central authority to make provision with respect to the powers, functions and duties of that authority; and to make provision for the protection and management of the environment and for matters connected therewith" (NEA,1980).

The Authority is empowered with administration of the framework legislation and is provided with wide powers to perform its assigned functions and duties. This includes coordinating all regulatory activities relating to the discharge of wastes and pollutants, and ensuring that local authorities are promoting compliance. Its objective is to encourage the prudent use and conservation of land resources.

It consists of six major divisions such as Human Resource Development, the Administration & Finance Division, the Environmental Pollution Control (EPC) Division, the Environmental Management and Assessment (EM&A) Division, the Environmental Education and Awareness (EE&A) Division, the Project Division and the Provincial Networking Division.

The Environmental Assessment Unit, which functions under the Environmental Management and Assessment Division, is responsible for implementing the Environmental Impact Assessment process according to the NEA. The Environmental Pollution Control Division is engaged in regulatory activities associated with the contamination of air, water, soil and industrial pollution. The following four units perform these functions: Pollution Control Unit, Waste Management Unit, Laboratory Services Unit and Monitoring Unit. The Waste Management Unit is in charge of Scheduled Waste Management. The Project Division consists of the following four units: the Pilisaru Waste Management Project Unit, the Waste Disposal Facility Construction Unit, the National Post Consumer Plastic Waste Management Project (NPCPWMP) Unit and the Sanitary Landfill Site Unit.

2.2.6. Local Government Agencies

There was a transfer of supervision rights related to waste management from the central government to PCs through the 13th Amendment of the 1978 constitution. In addition, LAs are responsible for collection and disposal of waste generated by residents who live in the locality.

There are nine PCs across the country, which provide administrative guidance to the District and LAs of the region. Their duty is to provide administrative services pertaining to the daily life of citizens and the community such as waste management. In order to achieve financial

assistance for waste management, the LAs have to submit the application of costs – excluding small amounts (5,000-15,000Rs.) – including costs associated with the placement of staff to the PC. It is necessary to get approval from the PC.

The PC has engineers in the Local Government Department in the PC and dispatch engineers in cases where the LA does not have engineer(s) but needs technical support or guidance for waste disposal, or there is a request from LAs. If a ministry inquires of LAs for some request(s) or guidance, it is usually undertaken through the PC. Local Authorities that are under the supervision of the PCs, are responsible for providing administrative services in line with the regional environment such as health and hygiene, waste disposal, regional environmental protection, and park management. Although they are able to formulate laws through the parliament and give instructions to the regional police, it is said that the legislative system of local government is not fully functional. The CPHI (Chief PHI) or the Public Health Department in LAs that is directed by the PHI conduct actual operations and management of municipal waste. Among the tasks engaged in, the (C) PHI is involved in collection, transportation, disposal of waste and also supervises the health management of waste collection workers and gives guidance and training on waste collection (e.g. health management guidance such as wearing gloves). In addition, they are in charge of recording the attendance of waste collection workers and their allocation to collection area(s), in addition to receiving complaints from residents.

Table 3: Legal Framework related to SWM at the national level

Year	Policy & Regulation	Description
1939	Urban Council Ordinance No. 61 of 1939	**Urban Council Ordinance No. 61 of 1939 Sections 118, 119, and 120 Specify waste management responsibilities of UCs**
1946	Nuisance Ordinance No. 62 of 1939 / No. 57 of 1946	**Section 1-12**
1947	Municipal Councils Ordinances No. 16 of 1947	**Sections 129, 130, and 131 in 1980 Legal and regulatory framework for waste management at the MC level**
1979	Code of Criminal Procedure Act No. 15 of 1979 – Public Nuisances	**Public Nuisances - Section 98**
1980	National Environmental Act No.47 of 1980	**Section 12 and 26 Establishment of CEA Amended by Act No.56 of 1988**
1987	Provincial Councils Act No.42 of 1987	**Amended by Act No.56 of 1988 LAs contain provisions for waste management**
1987	Pradeshiya Sabha Act No.15 of 1987	**Sections 93 and 94 Specify waste management responsibilities of PSs**
2007	Prevention of Mosquitoes Breeding Act No.11 of 2007	**Prohibition against creating conditions favourable to the breeding of mosquitoes.**
2008	National Thoroughfares Act No. 40 of 2008	**Section 64 (a), (b), (c) and Section 65**
2009	Gazette No. 1627/19 National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009.	**General Rules on SWM discharge and collection of waste (Prohibition of waste dumping at national highway and at any place other than places designated for such purpose by the LA)**

2.3. Jurisdiction and Role of Related Institutions in the Western Province

The Western Province in Sri Lanka consists of three districts; Gampaha, Colombo, and Kalutara and there are 48 LAs within the region. The Colombo District that faces the most serious SWM problems out of all other districts has 13 LAs sharing three disposal sites namely Karadiyana, Meethotamulla and Kaduwela. In the Western Province, the Waste Management Authority (WMA) is responsible for supporting LAs to improve their SWM. An overview of the role and jurisdiction of each agency is given below.

2.3.1. Western Provincial Council (WPC)

The WPC provides administrative guidance to the District and LAs of the Western Province; however, the task of SWM is delegated to the Waste Management Authority (WMA), which was established under the WPC. All LAs in the Western Province are expected to manage waste in accordance with the MSW Management Rule No.1 (2008) formulated by the WPC. The Department of Local Government (DLG) under the WPC coordinates between LA and the central government / WPC in the Western Province, in monitoring the financial status of each LA and also in allocation of subsidies from the central government and WPC to each LA taking into account sector-specific maximum expenditure (Ceiling) defined by the Finance Commission and priority of expenditures.

The head of the DLG is appointed as the Commissioner of Local Government (CLG), with three Assistant Commissioners in charge of each district in the Western Province.

2.3.2. Waste Management Authority of Western Province (WMA)

The WMA, which was established in 2004 under Waste Management Statute No.9 of the Western Provincial Council in 1999, is responsible for the supervision of waste management of the entire WP. The WMA Statute No.1 was formulated in 2007 specifying the jurisdiction, function and responsibility of the WMA. According to the statute, WMA is responsible for providing technical and financial assistance to all LAs of the WP to build their capacities in SWM, collecting waste data in WP, developing common final disposal sites to LAs and also assisting LAs to inculcate the waste management discipline in the public (through public awareness activity and environmental education etc.).WMA formulated a five-year Action Plan for 2015 - 2020 with targets such as improving the collection rate up to 72% by 2020 from 61% in 2015, increasing the recycling rate (based on waste generation amount) up to

38% by 2020 from 17% in 2015, increasing the recovery rate by compost and incineration up to 71% by 2020 from 13% in 2015. There are two incineration plants in the making: one in Kerawalapitiya and the other in Karadiyana waste dump. The Kerawalapitiya incineration plant is to be opened in 2020 while the one in Karadiyana is to be opened in 2021.

Seven LAs (Moratuwa MC, Boralesgamuwa UC, Kesbewa UC, Dehiwala Mount Lavinia MC, Sri Jayewardenapura Kotte MC, Maharagama UC, Homagama PS) out of thirteen in the Colombo District use Karadiyana cluster disposal sites, and WMA is in charge of its operation and maintenance, including the collection of tipping fees. A Waste Management Plaza has been planned and is under construction in this site, which includes facilities such as a sorting yard, bio-methanization and Waste to Energy conversion in addition to the existing composting facility.

WMA consists of five working divisions including the Technical, Financial, Administrative, Legal and Media Sections. The WMA is in charge of macro management and planning of SW in the entire Western Province. However, the CMC is in charge of operation and management of the Meethothamulla disposal site which is shared with the Kolonnawa UC. Waste collection in the CMC is carried out using 90 units of vehicles including 63 compactor trucks, which were provided by JICA in the 1990s, and the collection area is divided into six Districts. The two outsourced private companies; Carekleen and Abans (according to the waste management guidelines formulated by the CMC) is involved in waste collection, street cleaning and waste transportation in the CMC. The collection coverage is approximately 100%.

2.3.2.1. Policy and legal framework for solid waste management

The first piece of legislation pertaining to waste management in Sri Lanka was introduced during the colonial period in 1862 when the British administered the country. The first law was implemented through the ***Nuisance Ordinance*** (15 of 1862) which was subsequently amended (61 of 1939; 3 of 1946; 57 of 1946). The Ordinance vested power to the city government to inspect, regulate and control public nuisance, particularly inappropriate garbage disposal. Some key functions of the Ordinance are still in force with powers been exercised by public health inspectors (PHI).

Consequent legislations were introduced in 1939 and 1947 through the ***Urban Council Act*** and ***Municipal Council Act,*** respectively. However, during the establishment of Provincial

Councils in 1987, most of the political administrative legislations were amended and reformed.

At present in Sri Lanka, the basic legal framework required for municipal solid waste management (MSWM) is provided under an umbrella of Central Government, Provincial Council (PC) and Local Authority (LA) regulations and legislations. The 13th Amendment to the constitution (1987) and the Provincial Councils Act No. 42 of 1987, section 129, 130 and 131 of the Municipal Councils Ordinance (1980), Sections 118, 119 and 120 of the Urban Councils Ordinance, No. 61 of 1989, Sections 41 and 93 to 95 of the Pradeshiya Saba Act, No. 15 of 1987 are key instruments of legislations pertaining to waste management in Local Authorities. According to the Municipal Council Ordinance, the Urban Council Ordinance and the Pradeshiya Saba Act, all MSW generated within the boundary of Local Authorities (LAs) belongs to the institution itself, and therefore are mandated to remove and dispose of such waste materials without causing any nuisance to the public. This implies that of all the municipal waste management functions in Sri Lanka, the most daunting remains waste collection: the process of gathering waste from places of generation and storage, and transporting them to where they are stored, treated or disposed of (Batuwitage, 2004 cited in Kuruppuge & Karunarathna, 2014).

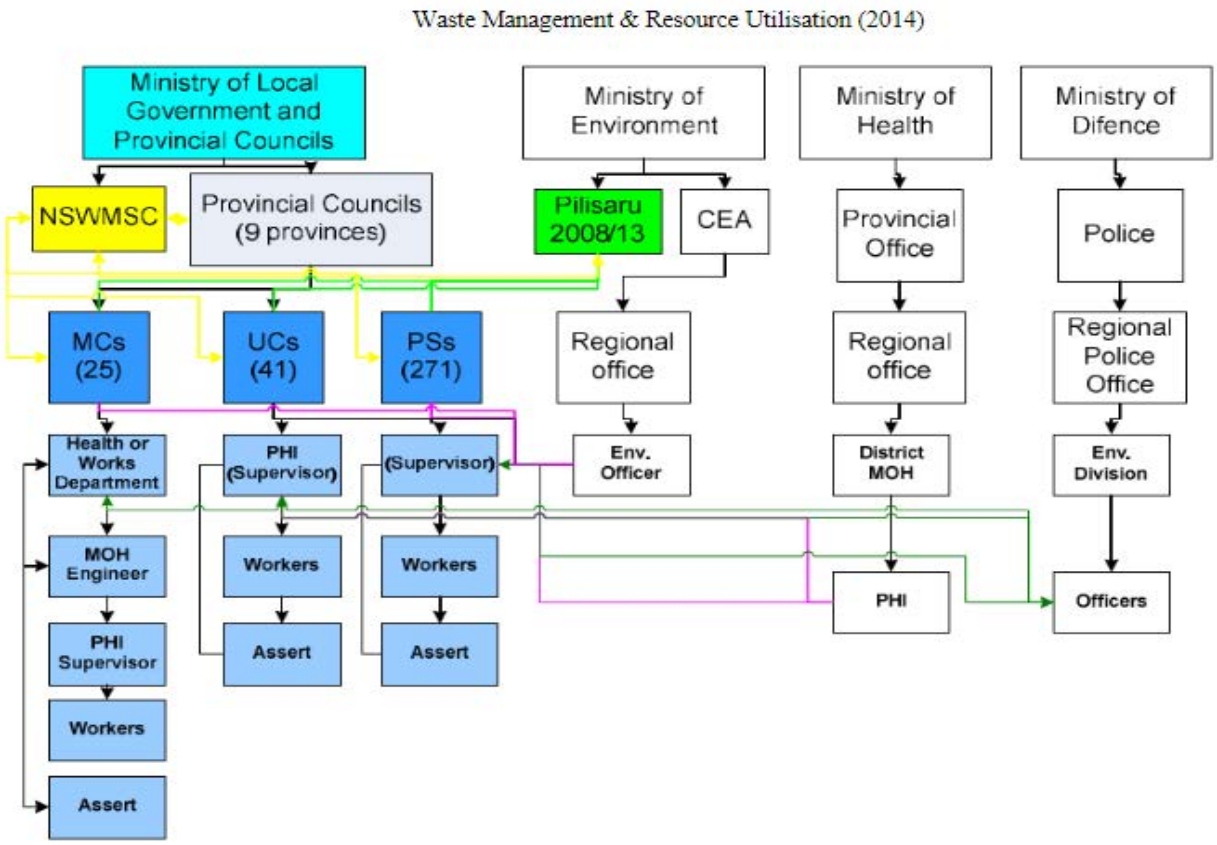
The National Environmental Act, No. 47 of 1980 (NEA) was enforced with aim of establishing a regulatory authority for environment monitoring and regulation. The Central Environmental Authority (CEA) was established under the NEA, and the approval, monitoring and regulation of all environmentally sensitive activities were expected to be administrated by the CEA. During the period 2001-2010, a successful effort was expended to uplift the overall MSW management conditions in Sri Lanka through the Japanese government cooperation (e.g. JICA, 2007). As a result of a preliminary study, two MSW dumpsites were rehabilitated out of which one has been considered the first ever semi-engineered landfill in Sri Lanka.

Furthermore, **The National Solid Waste Management Support Center** was established to provide technical and financial support for LA's to upgrade MSW management. Also, in year 2008, under the chairmanship of the Ministry of Environment and Central Environmental Authority (CEA) along with the participation of other government organizations, private institutions, NGOs and various technical experts; 'Pilisaru', which is a national program for

upgrading the MSW management sector was initiated. The Pilisaru programme promotes the 3R's concept and resource recovery from MSW prior to final disposal.

By the end of year 2013, approximately 125 LA's were financially assisted and technical support for development of MSW sector was provided. A significant tangible outcome of the Pilisaru program was the establishment of composting facilities in more than 100 LAs in Sri Lanka. Although these LAs are directly administered by the Ministry of Local Government and Provincial Councils through respective Provincial Councils, the draft national strategies and first national policy on MSW management was introduced through the Ministry of Environment and Natural Resources. At present, it has been recognized that the first policy attempt has failed due to poor stakeholder participation especially since the views of LAs were not reflected in the strategy and policy.

Figure 1: Institutional framework for MSW management in Sri Lanka



Source: Kuruppuge & Karunarathna, 2014

Involvement of defence ministry in solid waste management in Sri Lanka

During Rajapaksa government (2005- 2015), urban development was given a top priority and was assigned to the ministry of defence led by Gotabaya Rajapaksa; the brother of then president, due to political affiliations. This paved way to the involvement of human and technical resources of the military in urban development, mainly, in city cleaning including waste management. Defence ministry assumed control of the Urban Development Authority which was responsible for planning and construction in urban areas including Colombo and other cities such as Galle and Kandy.

Colombo's urban development was driven by the idea of transforming it into a "world-class city" and a "preferred destination for international business and tourism", according to the Secretary to the Ministry of Defence and Urban Development Urban development authority implemented the Metro Colombo Urban Development Project which initiated numerous measures in urban development.

The drainage infrastructure such as the primary and secondary canals and lakes, as well as micro drainage channels within the city were improved. The Beire Lake that had been neglected for years was completely rehabilitated and improvements were made to the Beddegana Park in Kotte under this project. The Green Growth Programme was carried out to protect the marshy areas in the metro region, enhance its biodiversity parks, reduce greenhouse gas emissions and improve the eco-friendly nature of the city. A number of new lakes were created in the Sri Jayawardenepura Kotte area, including Rampalawatta, the low-lying areas of Pelawatta, and in Thalawathugoda. The Weras Ganga Basin Storm Water Drainage & Environment Improvement Project involves the dredging of the Weras Ganga as well as improvements to the drainage of the Bolgoda Marsh and the development of several canals. In Colombo, the development of such spaces near Independence Square, Water's Edge, the Japan Sri Lanka Friendship Road, and the Nawala Wetland Park near Nugegoda have proven extremely popular. Similar initiatives were taken in the Gampaha District, and many more are planned in all the metropolitan areas that are being developed by the Urban Development Authorities.

The development of pavements and walk paths along the city streets is another area that has received significant attention during this regime. Dutch Hospital in Fort and the Colombo

Racecourse have been renovated and transformed into public spaces housing high-end shopping and restaurant facilities.

Likewise, distinct development was made in the urban contexts during this period. For the maintenance and to sustain these projects for the first time in Sri Lanka environment police was created. For the first time in Sri Lanka, the Environment Police was formed to maintain and sustain these projects. Sceptical views were created regarding such city beautification for neglecting the long-term socio-economic realities. Bringing the UDA under the Ministry of Defence was an indication enough that the urban development agenda did not include democratic and accountable local governance.

This involvement of military in the work of municipality drew criticism and it even altered the institutional landscape (The Island, 2013). Regardless, the involvement of military personals in waste management continued. The notion of waste management was established in the society in quite a strong manner through military ad campaigns facilitated by the Defence ministry. For example, once there was a TV commercial showing a monster appearing when a bag of garbage was disposed on the road which implicated the outcome of illegal garbage disposing. Unlike before, a fear regarding illegal waste disposal was slowly generated among the general public. Interestingly this gave rise to the concept of militarization of solid waste management in Sri Lanka.

However, with the regime change in 2015 urban development portfolio was attached to the newly formed Ministry of Megapolis and Western Development detaching it from the Ministry of Defence. (Wickremasinghe, 2010)

This context again changed with the election of Gotabaya Rajapaksa as the president in November, 2019. On the very second day of sworn in of Gotabaya Rajapaksa, the Environmental Police was reactivated. Environmental units have been re-established in all police stations and officers have been deployed on every road. Accordingly, a new Deputy Inspector General (DIG) and a new director in charge of the Environmental Unit have been appointed. Officers attached to these units investigate acts which are harmful to the environment and coordinate with local authorities to take measures for preventing such harmful incidents. They also monitor purification activities carried out by relevant organizations (Police Environmental Protection Division restablished, 2019).

This again re-established the notion of militarized solid waste management in the society. This has paved way to the formation of a new trajectory where the purpose of defence

extends beyond ensuring conventional security to promoting aspects of human security. Notably military involvement in solid waste management occurs whenever the Rajapakshas Rajapaksas are in power hence, it is obvious this has political implications more than anything else.

Governmental Solid Waste Policy: Centralization

As of November 1st 2016, a new governmental policy has been introduced in Sri Lanka. The exact bearings of the governmental policy, however, are said to be unclear. Some sources indicate a newly implemented *hard law* which is enforced with fines. On the contrary, other sources reveal non-collection of non-segregated waste. The reported segregation categories also vary depending on sources. *"Newsfirst",* a Sri Lankan news channel, reports that the Minister of Provincial Councils and Local Government (central government of Sri Lanka, also referred to as GoSL), has instructed waste collectors to collect waste segregated into two categories, namely degradable and non-degradable waste.

Other newspapers report three categories of waste segregation. Ada Derana, another Sri Lankan news channel, reports that all municipal councils within Sri Lanka have decided to refrain from collecting non-segregated garbage. This decision has been made after discussions between the central government (Ministry of Local Government and Provincial Councils), the Secretary of the Ministry, and municipal council commissioners and officials. According to the newspaper, waste must be segregated into organic (biodegradable) waste, inorganic (non-biodegradable waste) and recyclable waste (Ada Derana, 2016). The Colombo Gazette, an urban newspaper, similarly reports that residential waste needs to be segregated according to the above mentioned (3) categories in order for it to be collected; non-segregated waste is said to be ignored by collectors (Colombo Gazette, 2016).

2.4 International Agreements

The implementation of the governmental policy was triggered by the signing of the Paris Agreement in 2016. This agreement is part of a global action plan to limit global warming and climate change. As a signatory, Sri Lanka's National Government was requested to submit an 'Intended Nationally Determined Contribution Plan' – which included the National Waste Management Strategy (Wijayapala, 2016). The National Solid Waste Management Strategy has four key objectives

1. Prioritize waste avoidance over recycling and recycling over the other forms of environment ally sound disposal.
2. Reuse non-avoidable waste as far as possible.
3. Maintain the content of hazardous substances in waste at the lowest possible level.
4. Guarantee environmentally sound residual waste treatment and disposal as basic prerequis ites for human existence.

The decision-making capacity has been changed and moved to higher international levels of governance. The new policy has only been implemented in some Local Government Authorities; namely the Municipal Councils in Sri Lanka. As of now, the Urban Council and Divisional Councils are not included in the new governmental policy. Whether waste is supposed to be segregated in two or three tiers is quite unclear.

2.5 New trends in waste Management: E-Waste Management in Sri Lanka

According to the CEA (2019), the following organizations are licensed to collect e-waste.

- CFL and Florescence Tube Bulbs: Asia Recycling (Pvt) Ltd Pitipana South, Homagama.
- Ceylon Waste management (Pvt) Ltd 68/E/02, Kelanimulla, Kelaniya
- Cleantech (Pvt) Ltd 141, Kirula Road, Colombo 05
- Eco Biz World (Pvt) Ltd No. 621/3, Wekanda Rd, Walgama, Malwana
- E-waste & Logistics Solution (Pvt) Ltd 66/01/07, City Market 3rd Cross Street, Colombo 11.
- INSEE Ecocycle (Pvt) Ltd 413, R A De Mell Mawatha, Colombo 03.
- J F Supplier No. 276, Kottawaththa, Mawnella
- Moksh Worldwide (Pvt) Ltd Industrial zone, Sirigampola, Lunuwila, Wennappuwa
- N.S. Gunaratne & Company Pvt Ltd (Green Link Lanka) No 848/3A Negambo Road, Mabola, Wattala.
- Recotel Lanka (Pvt) Ltd No. 260, Sri Ramanathan Mawatha Colombo 15
- Think Green (Pvt) Ltd No. 57/33, MuthuwellaMawatha, Colombo 15

Sri Lanka has started working towards electronic waste recycling. Companies like Ceylon Waste Management and Green Links disassemble electronic waste and export components to major recyclers in countries like the Netherlands and Belgium.

On the consumer end, initiatives like Singer Sri Lanka's and Abans Group's electronic waste management projects, Access Engineering's annual e-waste collection drive and Dialog Axiata's M-Waste programme provide a valuable service as collection mechanisms for disposed electronic devices. Dialog's programme focuses specifically on mobile devices.

'M-Waste boxes' at every Dialog Arcade are there for any customer to drop off their discarded mobile devices and mobile related disposals such as old phones, batteries and headsets. They will be picked up by a CEA-licensed collector to be added to their recycling process. This is a new trend in waste management.

One such registered e-waste recycling factory in Sri Lanka, which recycles all types of e-waste (except CFL and tube bulbs), was able to recover 35,724 kg of plastic, 58,526 kg of metal, 83,358 kg of glass out of the total e-waste collection of 177,609 kg in 2012. Furthermore, out of the total quantity of metal, around 6,368 kg of complex metal were exported for refinement to the world's largest precious metal refinery. In addition, they earned foreign currency by trading the extracted gold, silver, palladium, and copper in the London Bullion Market (LBM) and London Metal Exchange (LME). The rest of the materials were sold to different companies in the country, which reuse these materials for a variety of products. This factory has also created new jobs for skilled and unskilled personnel as well.

Asia Recycling Company under Orange Electric, which is the first recycling company in South Asia, is another registered factory that particularly recycles all types of CFL and tube bulbs. They extract materials such as glass, plastic, metal, and wood, which are sold to different companies within the country for reuse, and chemicals such as mercury and phosphorous powder are exported to Germany for refining, thus earning foreign currency (Bandara, 2014).

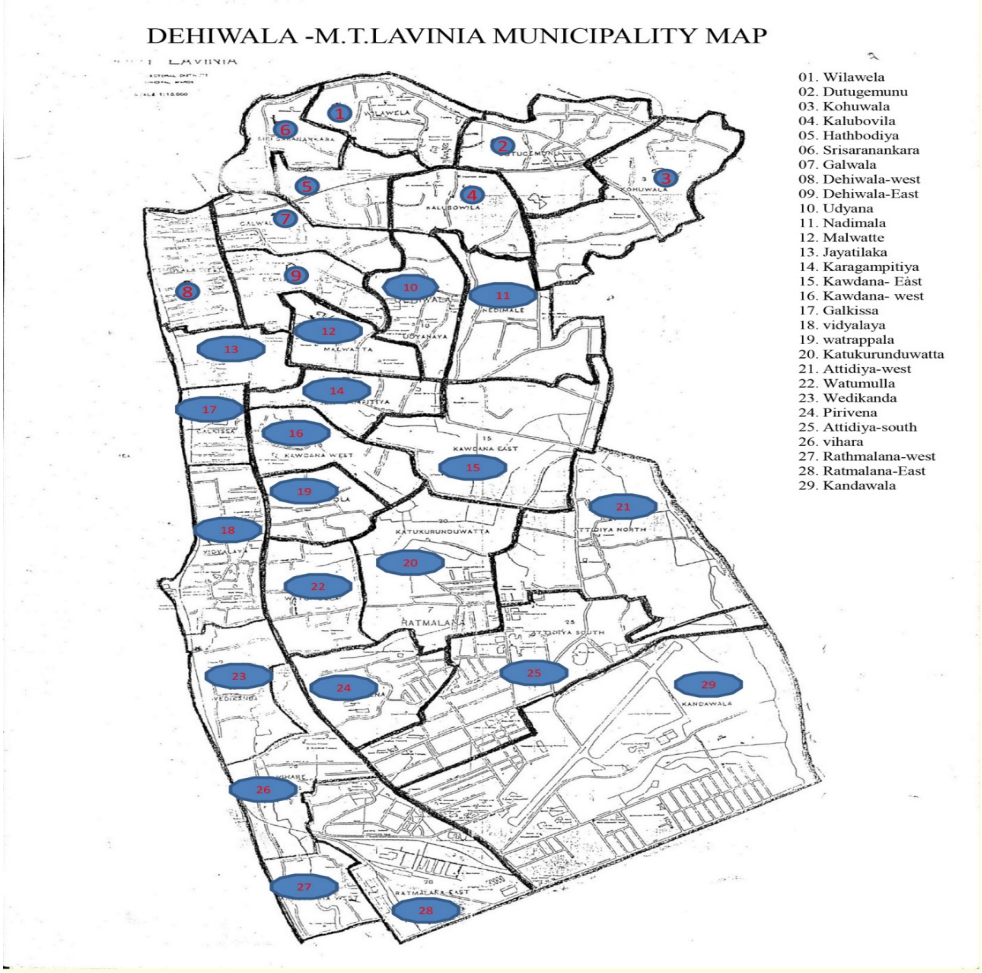
2.6 Solid waste management architecture in the selected locations

2.6.1. Dehiwala Mt. Lavinia Municipal Council in Western Province

Dehiwala Mount Lavinia Municipal Council (DMMC) area is the second largest Municipality in Sri Lanka, and covers an extent of 2109 hectares. It lies south of the Colombo Municipal Council area and separated from it by the Dehiwala canal which forms the northern boundary of DMMC. Its southern limits lie in Borupana Road and the eastern boundary is Weras Ganga with its canal system and including some areas to its east (Pepiliyana, Gangodawila and Kohuwala).

DMMC is composed of 29 wards whose extents vary from 29Ha. (Galkissa), the smallest and 305.6Ha (Kandawala), the largest. the largest 305.6 Ha (Kandawala). Dehiwala has become an attractive location for holiday accommodation facilities for both business travelers and holiday seekers due to its close proximity to Colombo and Mount Lavinia beach. The town has also experienced extensive pollution because of uncontrolled growth and heavy congestion.

Mount Lavinia on the other hand, which is also located in the southern part of the city, is a residential suburb, which consists of beach resorts and restaurants, is a hot spot for tourism, and laid back nightlife.



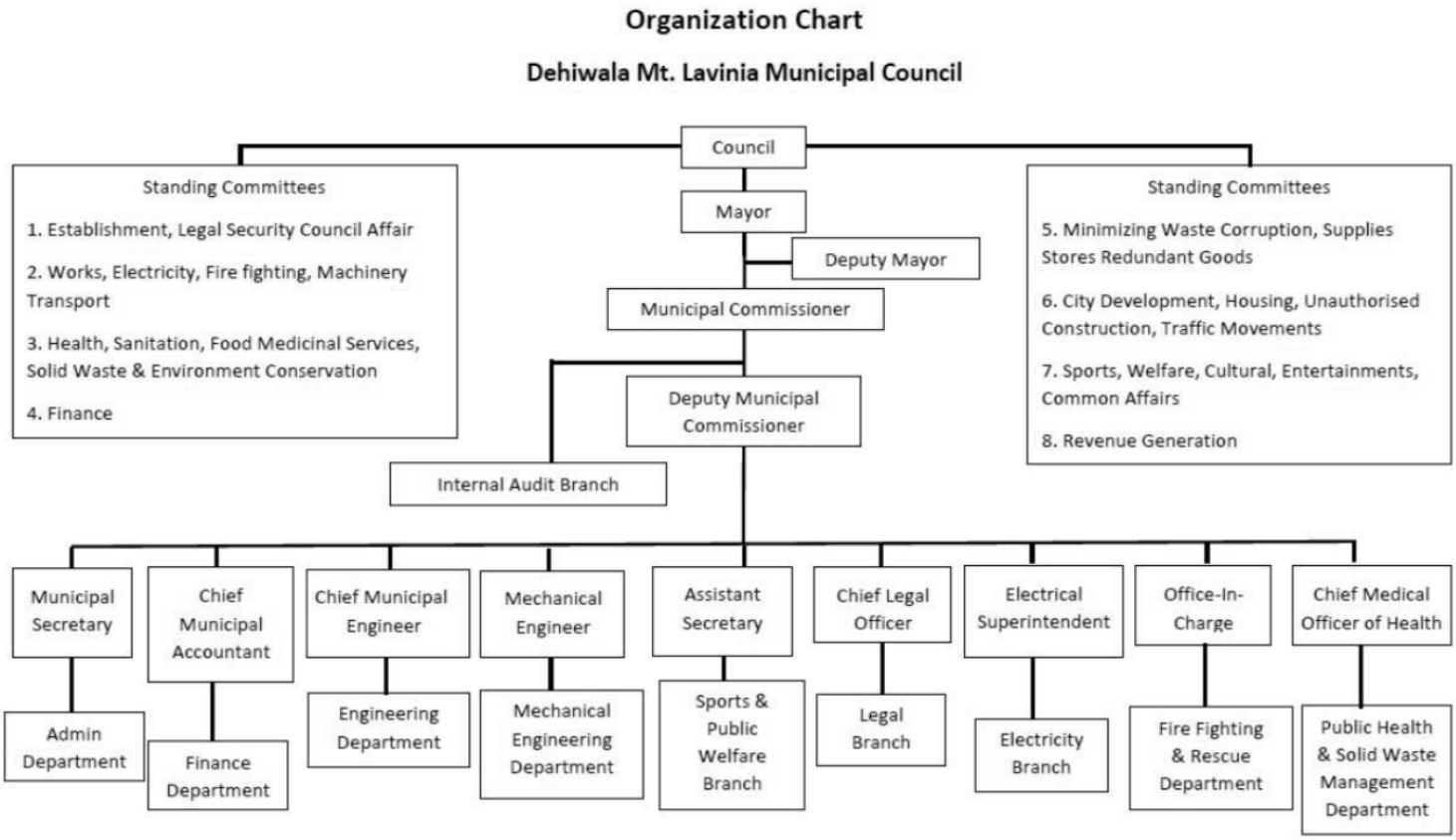
Colombo's climate is tropical throughout the year. From March to April the temperature averages around 31 degrees Celsius maximum. The only major change in the Colombo weather occurs during the monsoon seasons from May to August and October to January. Heavy rain is experienced during these seasons. Rainfall in the city averages around 2,400 millimeters a year.

2.6.2 Current Status and Problems of Solid Waste Management

Dehiwala Mt. Lavinia MC has a Solid Waste Management & Environment Protection Standing Committee which is assisted by the Solid Waste Management Department (SWMD). The Deputy Commissioner serves as the head of SWMD. Among the responsibilities of the SWMD are, waste collection and transportation Service, public health activities (Dengue), road sweeping and public awareness on waste separation. In addition, the SWMD consists of the Refuse Collection & Disposal Division where the Chief

Public Health Inspector (CPHI), PHI, and Health Supervisor have been appointed These individuals are responsible for cleaning services together with waste collection and transportation in each Ward. The Health Education Officer carries out public awareness programs for waste separation. The Environment Assistants implements other environmental protection programs. While Mechanical Engineers in the Transport & Engineering Division are in charge of maintenance, repair, and inspection of collection vehicles such as tractors and trailers, this position does not exist in Dehiwela- Mount Lavinia. Even though there are 2 MOHs, they are not actively involved in SWM activities. The figure below illustrates the organizational structure of DMMC.

Figure 2: Structure of the Dehiwala - Mt. Lavinia MC



Source: DMMC, 2019

The MC has not formulated any master plan or action plan related to SWM. The existing "Solid Waste Management Policy" of Dehiwala Mt. Lavinia MC was formulated more than 15 years ago and remains obsolete. There is a requirement for an update of the policy and an upgrade of the SWM master plan based on this policy.

In relation to storage and discharge of waste in Dehiwala Mt. Lavinia MC, separate collection systems have been established in some areas by the end of October 2015. However, containers for separated organic waste have not been distributed to each household (currently asking WMA to provide containers for waste separation). Therefore, residents have been instructed to discharge separated organic waste and other waste in a different plastic bag. Since door-to-door collection is provided by the MC, residents put waste on the roadside in the morning of the designated collection day. The community members have to segregate waste as organic and inorganic. The organic waste is collected on Tuesdays and Thursdays. These include food waste, plants, branches etc. The MSWM compactors carry out door to door collection in all 29 wards, which is then transported to the Karadiyaana open dumping site. The inorganic waste is collected on Wednesdays and Saturdays. Once collected, MSWM workers sort valuable items and sell them to private vendors.

In terms of collection and transportation, the Dehiwala Mt. Lavinia MC directly collects and transports waste from households. Under the supervision of PHI and SV, 52 collection drivers and 443 collection workers (including road sweepers) collect waste.

In the collection area, waste is separated into organic and other waste. From the end of October 2015, a separate collection system has been implemented in Ward # 16 ~ 29 of Rathmalana on a pilot basis and was extended to all others including Ward # 1 ~ 15 of Dehiwala within two months. Waste collected by Dehiwala Mt. Lavinia MC is transported to the Karadiyana dumping site. According to the truck scale installed in the DS, collection volume records 170 tons/day. The Dehiwala Mt. Lavinia MC does not collect any waste collection fee from households. On the contrary, they collect a fee by truck load from large waste generators (i.e. those generating more than 500kgs/day) depending on the type of waste. As of 2015, a collection fee was imposed on approximately 900 large waste generators.

2.6.3 Intermediate treatment in Dehiwala Mt. Lavinia

There are small-scale biogas facilities and two recycling facilities in the MC where recyclables are sorted and stored after implementation of separate collection. It has been revealed that valuable materials are taken out by collection workers during the collection process and sold to middleman shops on the way to the DS but after implementation of waste separation, other waste including valuable materials are transported and sorted in the recycling facilities. Waste received by this facility includes not only waste collected by the

MC but also waste brought by neighbouring residents. However, since the capacity of the facility is limited, not all other waste is transported to the facility. The main target is neighbouring areas of the facility such as Ward 15 (Kawdana-east) and Ward 20 (Katukrunda watte). Later, the target areas have been expanded to Ward 21 (Attidiya-north) and Ward 25 (Attidiya-south). Valuable materials sorted by type are sold to recyclers and income from the sale is shared among collecting workers.

2.6.4 Issues of Technical System

In terms of the issue of collection and transportation, no containers have been distributed among residents to collect separated organic waste. Therefore, it is impossible for collection workers to open plastic bags to check if it is organic waste or other waste each time waste is loaded. In order to make it more efficient and hygienic, a separate container for collection of organic waste should be distributed among the residents. Old vehicles should be replaced with new vehicles. In terms of the intermediate facility, the two existing Resource Centers are to be operated as a recycling facility after the implementation of separate collection. Several issues such as collection management system of other waste, sorting system, operating system of the facility and data management systems are heightened concerns. In addition, these recycling facilities are located in residential areas and therefore sufficient environmental measures against offensive dogs and flies are required.

2.6.5 Public Awareness

When discussing the current Situation of Public Awareness Activities in the Dehiwala Mt. Lavinia MC, separate collection has been implemented in some areas (Rathmalana) and public awareness activities have been designed to promote source separation. In order to expand separate collection throughout the MC, the Health Education Division prepared leaflets with collection dates and collection points for each Ward. In addition, house-to-house visits by PHI Public announcements, distribution of leaflets regarding waste separation, demonstration of waste separation, facilitating the reception of complaints and requests through social media platforms like Facebook and advocating for cooperation in waste separation through mobile phone SMS in collaboration with mobile phone companies are other initiatives in this regard.

2.6.6 Participation Level and Manners of Citizens

The cooperation level of residents for source separation is unknown since separate collection began recently. Many of the complaints that the MC receives from residents are related to poor waste discharge manners.

2.6.7 Issues of Public Awareness Activities in Dehiwala -Mt. Lavinia MC

The Health Education Officer planned a variety of educational activities in accordance with source separation and there is a need for formulating the discharging rules (entailing rules pertaining to target waste for separation, collection date, discharge point, and discharge method) for residents to comprehend them easily. It is also necessary to implement environmental education in schools and activities to improve discharge manners at the same time.

2.6.8 SWM Finance

Each year, the total SWM expenditures reaches the level of the total expenditures budgeted for the year and accounts for around 23% to 26% of the total municipal expenditures. On the other hand, collection rates of the waste fees are extremely low accounting for less than 6% in the annual total of the SWM expenditures. The main reason for these low rates is the implementation of a waste collection service free of charge for households and small/middle-scale businesses and collection of fees only from large-scale businesses. According to the municipality, large-scale businesses are those generating an amount of waste that equals half a tractor-trailer daily and usually is decided based on personal judgments of Public Health Inspectors. Therefore, the number of businesses that pay the the waste fee are very few. Illustrating this, only 900 businesses have been registered as payers by the end of October 2015.

The officials have tried to introduce a tax for waste collection on multiple instances. However, the elected politicians have rejected such taxes assuming it would have a negative impact on their voter base. This is a common trend in Sri Lanka. Whenever the central government or the local councils attempt to introduce new taxes, the opposition from the public is fierce. Recently, the government attempted to introduce a price formula to Petrol and Diesel to decide the fuel prices on a weekly basis. The government was faced with a massive opposition from the public in response to which the government had to revoke the formula and return to the previous system. In the following year the ruling party lost the presidential election by a sizable margin and many politicians associated this loss with the

introduction of the above mentioned price formula. Due to these instances Owing to instances of this sort, politicians are more prone to reject or protest against taxes levied on their voters.

2.6.9 Waste Generation Amount

The figures indicated below is a compilation of waste generation amounts calculated based on the waste generation rate obtained by Science and Technology Research Partnership for Sustainable Development' (SATREPS) in November 2012 and waste generation units obtained by a locally outsourced survey. The figures show that the municipal waste generation amount is 175.2 ton/day and waste generation rate is 933g/person/day.

Table 4: Waste Generation Amount Dehiwala Mt. Lavinia Municipal Council

Source		Generation rate		Generation sources	Generation (ton/day)
Residential	Collection	0.390	Kg/person/day	187,684	73.2
Commercial	Hotels (large)	1,000.00	Kg/(hotel)	11	11.0
	Hotels (middle & small)	56.00	Kg/(hotel)	130	7.3
	Restaurants (large)	200.00	Kg/(restaurant)	79	15.8
	Restaurants (middle)	112.50	Kg/(restaurant)	18	2.0
	Restaurants (small)	21.60	Kg/(restaurant)	29	0.6
	Organic-shops (large)	350.00	Kg/(shop)	25	8.8
	Organic-shops (middle)	20.00	Kg/(shop)	67	1.3
	Organic-shops (small)	4.76	Kg/(shop)	142	0.7
	Non-organic shops (large)	40.00	Kg/(shop)	78	3.1
	Non-organic shops (middle)	15.00	Kg/(shop)	186	2.8
	Non-organic shops (small)	1.69	Kg/(shop)	179	0.3
Institutions	Schools	12.50	Kg/(school)	39	0.5
	Hospitals	600.00	Kg/(hospital)	22	13.2
	Other institutions	9.17	Kg/(institution)	125	1.1
	Other educational institutions	8.00	Kg/(institution)	12	0.1
	Buddhist temples	5.15	Kg/(temple)	0	0.0
	Hindu temples	37.08	Kg/(temple)	0	0.0
	Mosques	1.50	Kg/(mosque)	0	0.0
	Churches	10.00	Kg/(church)	0	0.0
	Public park	100.00	Kg/(park)	2	0.2
Market		3,000.00	Kg/(public market)	8	24.0
Industries		380.00	Kg/(industry)	24	9.1
Total					175.2

Source: CEA, 2016

2.6.10 Waste composition of Dehiwala Mount Lavinia

The results of the locally outsourced survey on waste composition conducted from 15th to 21st October, 2018 in Karadiyana Disposal Site are shown below:

CATEGORY	RATE
KITCHEN WASTE	**52.5%**
PAPER	**13.6%**
TEXTILES	**4.3%**
GRASS AND WOOD	**14.1%**
SOFT PLASTIC	**9.1%**
HARD PLASTIC	**1.4%**
RUBBER AND LEATHER	**0.6%**
METAL	**0.7%**
GLASS AND BOTTLE	**1.2%**
STONE AND CERAMIC	**2.3%**
OTHER	**0.4%**

Source: CEA, 2016

2.6.11 Waste Flow

JICA report (2016) has been prepared by analyzing the locally outsourced public opinion survey, statistical data collection, and the results of census. Further, the report reveals that the Dehiwala Mt. Lavinia MC had not begun separate collection as of November 2015 although it was to be implemented the same year. For this reason, it is assumed that waste flow is based on separation collection as same as the Moratuwa MC. According to waste flow, collection rate ((discharge amount + direct loading amount)/generation amount) was 95.40%. As per the recycling rate for generation amount, compost was 0.5%, material recovery was 3.4%, and the total rate was lower than 3.9%, which was lower than the surrounding municipalities. On the other hand, final disposal rate for generation amount has reached 94.1%, which has become a burden on the Karadiyana disposal site (see Figure 4-74: Waste Flow of Dehiwala Mt. Lavinia MC (2015) 4.10.6).

As discussed in section 5.0, DMMC is densely populated and a large quantity of solid waste is generated both by households and commercial establishments. The problem is further exacerbated by waste generated in the large and medium scale industries located in the South of the City i.e. in Attidiya and Ratmalana areas ; a situation not faced by the adjacent

MC of Sri Jayawardenapura Kotte . The Colombo South Teaching Hospital located in Kalubowila and a few medical centers also generate approximately 1 metric ton of waste which the DMMC has to also deal with. An estimate of the solid waste generated in the city has been prepared by the Municipal Council. This has been quantified on the basis of two distinct areas of DMMC, i.e. Dehiwela area consisting of wards 1 to 14 and Ratmalana area constituting wards 15-29 (wards 15 – 29).

2.6.12 Current Situation of Other Waste Management

2.6.12.1 Current Situation of Industrial Waste Management

Generation Amount & Disposal Amount -Since general waste generated by businesses such as shops other than industrial waste is collected together with general municipal waste, generation amount and disposal amount of industrial waste are not identified.

2.6.12.2 Collection, transportation and Disposal

General waste from businesses are collected with general municipal waste, discharged in Karadiyana DS, and is carried to Karadiyana disposal site. The urban council (UC) is not involved in handling hazardous waste of industrial waste.

The level of waste management in Dehiwala-Mt. Lavinia MC is considered high due to its high collection rate. However, the final disposal rate reached 94.1%, and was a considerable burden on the Karadiyana disposal site. Therefore, it is important to contribute towards efforts of waste reduction. The MC had plans of implementing separate collection of organic waste in some areas within the year and to expand gradually. Even in the Moratuwa MC where separate collection was introduced about a year earlier, organic waste was not completely separated. Therefore, there was a need for executing public awareness campaigns/programmes on segregation of waste, promoting the use of sustainable packaging and storage and improving waste discharge methods. It is desirable to implement projects aiming to promote 3R activities like:

- Improvement of Organization and Legislation
- Formulation of Solid Waste Management Plan

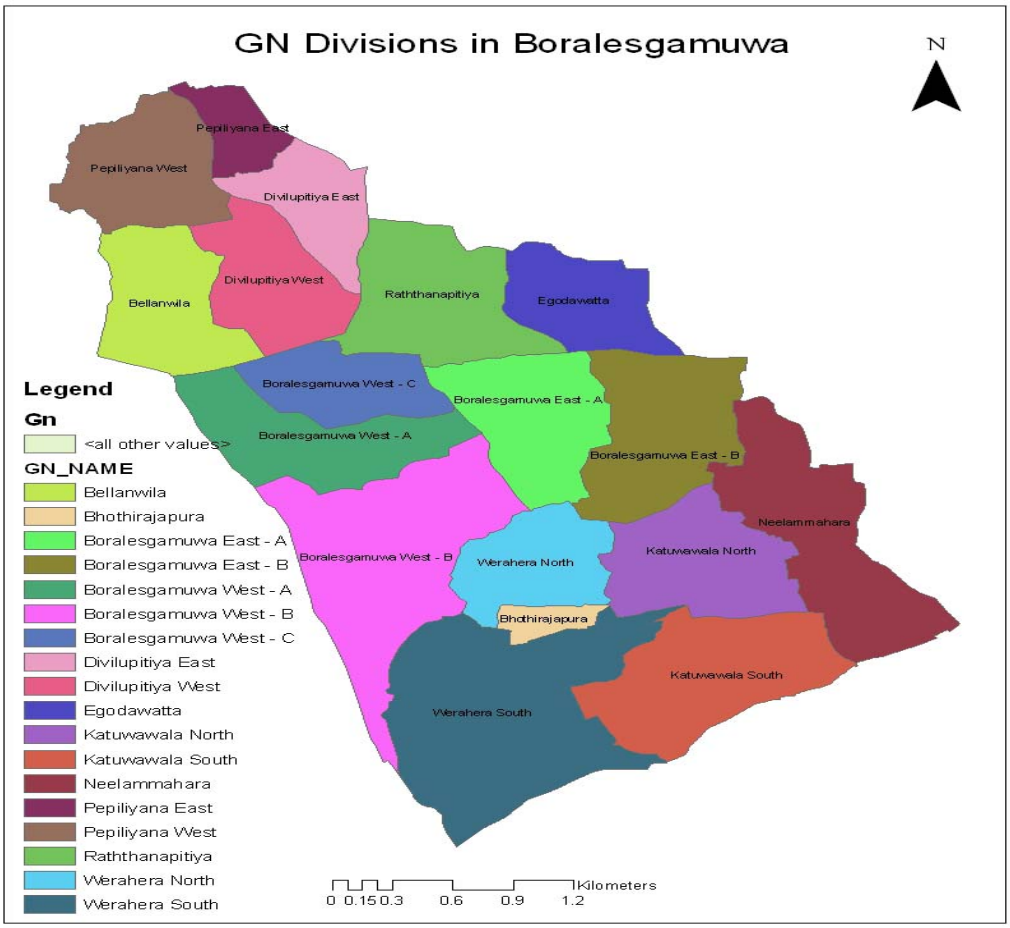
The level of waste management of Dehiwala Mt. Lavinia MC is considered higher compared to other municipalities. To establish the current management system, the DMMC has made various improvements based on the plan 10 years ago. There is a need to develop a solid waste management plan, since it is essential to formulate the waste policy in the future. The

Dehiwala Mt. Lavinia MC is currently using the Karadiyana disposal site operated by WMA but the MC should be responsible for waste generated by its own wards. Therefore, it is desirable for the MC to identify its own role for the operation of a final disposal site within the master plan.

2.6.12.3 Boralesgamuwa Urban Council

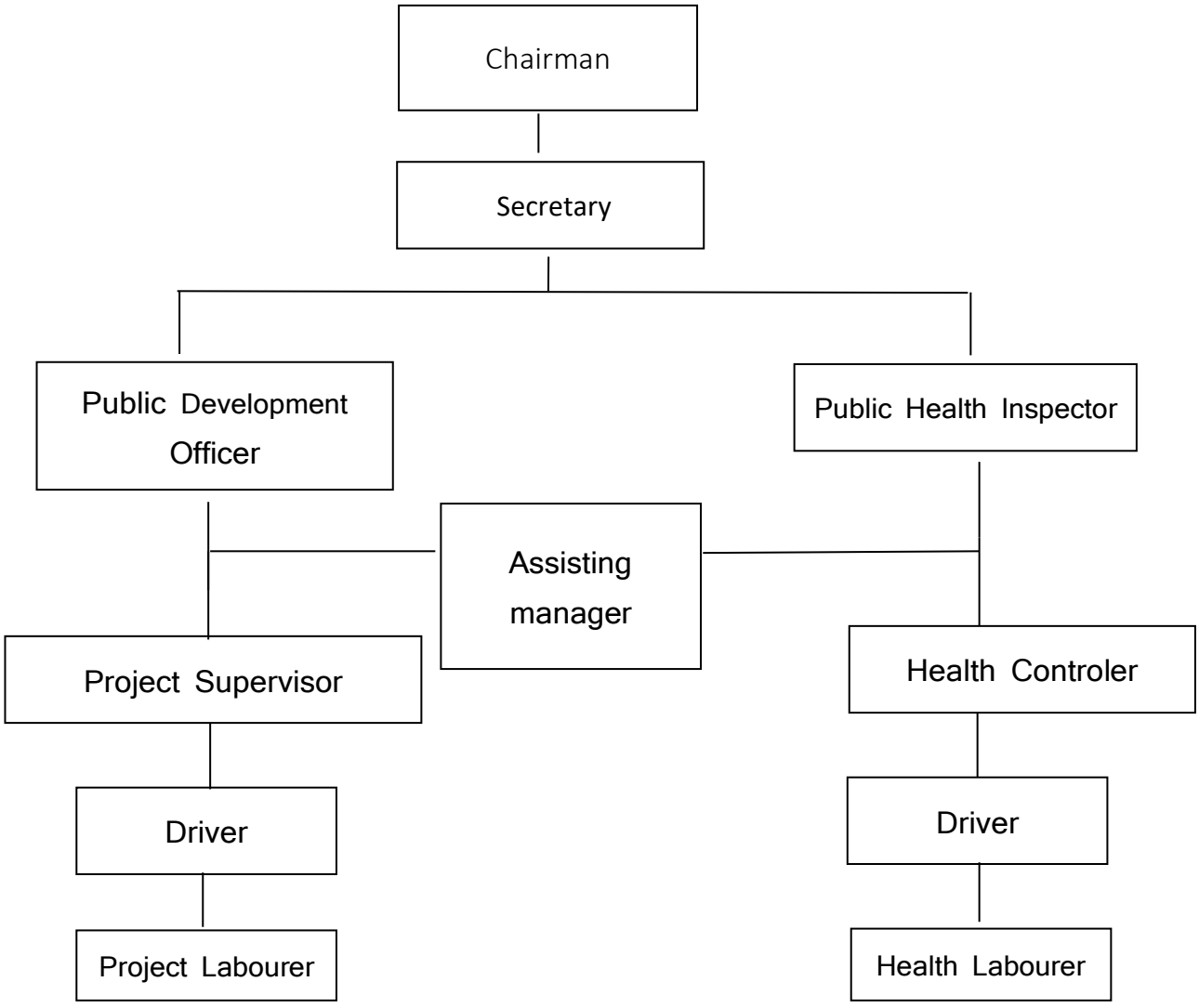
The Boralasgamuwa Urban Council (UC) is a relatively new urban council which originally used to be a part of the Kesbewa municipal council. The council expands across 13.5 square kilometers and is made up of 18 Grama Niladhari (GN) divisions. According to the 2011 Census report, there are 37,260 permanent residents in the Boralesgamuwa Urban Council area. Moreover, this urban council area consists of 6 schools, 1 monastery for Bikkhus, 3 churches, 14 Buddhist temples, 06 banks in addition to 03 maternal clinics, 01 office of medical officer which is referred to as MOH. Also, it has 01 Filarial fever centre, 01 Indigenous medical centre, 01 library, 01 public hall, 01 sports ground, 03 cemeteries, 03 common markets and 01 crematorium.

Map 1: Boralesgamuwa Urban Council Area



The Boralesgamuwa UC has a Solid Waste Management & Environment Protection Standing Committee (SWMEPSC). The Chairman serves as the head of SWMD. Waste collection and transportation service, public health activities (Dengue awareness programmes), road sweeping and promoting public awareness on waste segregation are the responsibilities of the SWMEPSC. In addition, the SWMD consists of the Refuse Collection & Disposal Division where the Chief Public Health Inspector (CPHI), PHI, and Health Supervisor are employed.

Figure 3: Structure of the Boralasgamuwa Urban Council Solid Waste Management Committee



Source: Boralasgamuwa MSW strategic plan Presentation, 2019

The committee is responsible for the cleaning services together with waste collection and transportation of waste from each ward. The Health Education Officer carries out public awareness programs for waste separation. Mechanical Engineers of the Transport & Engineering Division are in charge of maintenance, repair, and inspection of collection vehicles.

In terms of storage and discharge of waste in the Boralesgamuwa UC, separate collection systems have been established in all the wards. Residents have been instructed to discharge separated organic waste and other waste into a single storage bag without being further segregated.

The door-to-door collection service is offered by the MC and households put waste on the roadside in the morning of the designated collection day. In terms of Collection and Transportation, the Boralesgamuwa UC directly collects and transports waste from households.. Ten collection drivers and forty collection workers (including road weepers) collect waste under the supervision of PHIs. Waste collected by the Boralesgamuwa UC is then transported to the Karadiyana dumping site. According to the truck scale installed in the DS, collection volume is recorded at 34 tons/day. The Boralasgamuwa UC does not charge any waste collection fee from households. On the other hand, they collect a fee by truckload from large waste generators (i.e. those who generate more than 500kgs/day) depending on the type of waste.

2.7. Pressure groups that influence these institutions

2.7.1. Academics

University academics in Sri Lanka have been acting as major pressure groups for changes in MSWM practices. The academics have played a key role in introducing more sustainable ecofriendly solutions for MSWM. Moreover, academics play an important role in comprehending issues, challenges and limitations of the existing solid waste management system. These academics have studied the practices of Municipal councils on disposing waste, household waste management behaviours, informal solid waste managers, alternative waste management systems, current administrative structures etc. They have acted as a pressure group by pressurizing the government and waste management authorities to change and adopt new and more sustainable waste management systems.

2.7.2. Religious leaders

Pressure groups perform a pivotal role in regulating the social dynamics. Pressure groups could be defined as a group of people who work together to influence what other people or the government think about a particular subject, in order to achieve their objectives Pressure groups attempt to exert influence on every phase of the political process. They endeavor to influence their own members and other groups to urge political parties to endorse favored policies and attempt to secure favorable decisions from executive legislative and judicial officials. Possibly the most significant contemporary development in pressure groups and their activities is the continual increase in their efforts to mold public sentiment by utilizing the media of mass communication(Turner, 1958). Any such organization and/or individuals who have influence over solid waste management in Sri Lanka are identified as pressure groups in this context; the function of pressure groups is significant in the context of solid waste management.

Sri Lanka being a country with a majority of Buddhists has an inseparable linkage to Buddhism. Hence Buddhist monks have been assigned traditional authority and have earned an immense respect from the society. The Buddhist monks have critical power in Sri Lanka especially within the realm of national issues. Similarly, the involvement of Buddhist monks in protests against garbage disposal draws significant public attention and have a huge potential in controlling masses. Relative to other religious leaders, Buddhist monks play a significant role in organizing and mobilizing the protesters against disposal of garbage at places like Aruwakkalu, Karadiyaana etc. Participation of religious leaders gives a sort of a validation and justification for protests. The most recent protest was held in August, 2019 with the participation of more than 1000 protesters in Aruwakkalu. The religious leaders who were also among the protestors voiced their concern over the manner in which garbage was being disposed of in the area.

Among those present were Chief Incumbent of the Buddhist Centre in Puttalam, Ven. Udukadana Kusaladamma Thera Kurukkal S.Sundarama, Moulavi Abdullah Mohomad Ali and Wanathawillu Parish Priest, Christy Perera.

The protestors said the assurance made by Megapolis and Western Development Minister, Patali Champika Ranawaka that the proposed sanitary landfill would be operated according to the highest international standards were mere words (Jayasinghe, 2019). In March 2019,

Former Minister of Mega polis and Western Development, Patali Champika Ranawaka criticized religious leaders and politicians for misleading the public by spreading false information to gain political mileage (Hemmathagama, 2019).

Involvement of religious leaders against garbage disposal began following the Meethotamullla crisis in 2017. This generated a fear in the society giving rise to a series of protests in Karadiyana which aimed to prevent another catastrophe in the future with the participation of Buddhist monks and other religious leaders in the locality. (Dayananada, 2017). Needless to say that they were quite successful in advocating and gaining public attention and creating awareness of the issue.

2.7.3 Youth Protesters

Sri Lankan youth accounts for 27% of the entire population and play a key role in protests against garbage disposal in Aruwakkalu and karadiyana. Given that youth constitute a generation that is more exposed to the negative long-term consequences of mismanagement of solid waste, they have a pronounced right to protest against matters of waste management. Former president of the Inter University Students' Federation, Lahiru Weeerasekara said that the Megapolis and Western Development Minister was trying to show that he had found a solution for Colombo's garbage issue but he was only doing so by bringing the garbage to Aruwakkalu.

2.7.4 International and local non-governmental organizations (NGOs /INGOs)

NGOs perform a commendable task in creating awareness in society while acting as a pressure group. NGOs and INGOs often have the ability to amass experts and provide facilities to activists to pressurize the government to improve MSWM. Recently, few of the Prominent NGO's in the country including the Centre for Environmental Justice (CEJ) protested against the unsustainable MSWM practices carried out by the central government. Mr. Hemantha Withanage, director of the Centre for Environmental Justice, questioned the sustainability and the cost/benefit ratio of the government's decision to transport solid waste collected within the Colombo Municipal Council to Aruwakkaru Sanitary Landfill in Puttlam using rail carts. "Why take so much of garbage such a long distance?It is a costly affair. The Railway Department is paid Rs. 975 for 1 km for one carriage. Then 27 carriages going a distance of 170 km will cost Rs. 4.2 million a day. That is Rs. 1,500 million a year," said Mr. Withanage. He pointed out that the new landfill in Puttalam, was close to the Wilpattu

National Park and underneath was the Thabbowa Freshwater Aquifer- the largest in the country. This area is high in biodiversity. Mr. Withanage therefore observed, “If toxic waste seeps through the cracks in the landfill to the aquifer it will cause irreversible damage,”. He claimed that the issue was causing social problems, and that this matter should not lead to any deaths as in the past. Moreover, United Nations and its affiliations act as pressure groups in environment related concerns. The United Nations Development Programme (UNDP) in Sri Lanka initiated its first Government Co-Financed project with the Kaduwela Municipal Council to effectively manage solid waste in the area to generate biogas energy.

In 2015, UNDP provided technical assistance to the Kaduwela Municipal Council (KMC) to pilot the Solid Waste Management Project under the ‘Every Drop Matters’ Project which contributed to the ‘Pavithra Ganga Programme’ of Ministry of Mahaweli Development and Environment. Together with the local partner, Janathakshan, the innovative treatment technology was tested and used during this phase and was then expanded to adapt to the locally designed biogas technology for Waste Managemen. (UNDP, 2016).

2.7.5 Civil movements

Civil movements can also be recognized as pressure group. There are many instances where communities organized themselves against MSWM practices of the local councils and the Central government. One such civil movement was evident in Meethotamulla where community members organized themselves as the “People’s Movement against the Meethotamulla, Kolonnawa Garbage Dump (PMMKGD)”, and staged multiple protests. The PMMKGD continued to battle the authorities legally, filing Fundamental Rights cases and staging protests. Both the Rajapaksa regime and the previous government responded to these protests with either suppression or neglect. In the resulting legal dispute, the Supreme Court ordered garbage to be deposited in Meethotamulla as a temporary measure and declared an area of two acres for the purpose. Nevertheless, when implementing the court order the officials were lethargic and inefficient which resulted in more and more solid waste being added to the Meethotamulla garbage dump. (ROAR, 2017).

2.7.6 Mass Media

Mass media shapes attitudes and mindsets of communities. A significant a concern for environment has emerged in Sri Lanka through the involvement of mass media. Many media stations have launched many environmental programmes. A leading TV station in the country called “Sirasa” commenced a mission named ‘’Thuru Sirasa” with the objective of creating a sustainable future (Sunday Observer, 2019). Another station named ‘Derana’ initiated the ‘Nature Force’ Environment Protection and Preservation Porgramme under its charity arm, ‘Manusath Derana’ falling in line with the United Nations 2030 agenda and Sri Lanka’s vision to be an eco-friendly nation. Accordingly, it is clear that mass media acts as a strong pressure group in solid waste management.

Therefore, the role of pressure groups in creating awareness on waste management cannot be undermined. In the context of Sri Lanka, pressure groups are motivated by self-centered goals. Rather than searching for sustainable solutions, they often end up aggravating issues. Frequently -such movements are demoralized by political influence coupled with administrative setbacks. Despite the political demotivation, pressure groups must be committed to achieving long-term goals. Solid waste policies in Sri Lanka have been established with the objective of ensuring environmental accountability and social responsibility of all stakeholders. However, the problem lies with implementation. Hence, it demands active involvement of pressure groups and they must be integrated with each other allowing a dialogue between pressure groups for bringing the ultimate goodness to people and future generations.

Even though The Urban Development Authority had taken steps to construct a waste disposal facility in Muthurajawela to dispose garbage collected in Colombo emulating proper scientific procedures, the area selected is questionable as it is a marsh. There has been heightened debate about the garbage issue in Sri Lanka where key individuals have attempted to bring it to the notice of authorities. For an example, the Archbishop of Colombo, Malcolm Cardinal Ranjith has criticised the dumping of garbage in Muthurajawela by the Colombo Municipal Council and some other government agencies. His eminence reiterated that Muthurajawela marsh has been gazetted under the Environmental Protection and Conservation Act, adding that the ad hoc dumping of

garbage, without carrying out a proper study, would lead to the destruction of this natural resource.

2.8 Meethotamulla disaster and its impact on solid waste management.

On 14th April, 2017, while people across the island were preparing to celebrate the Sinhala and Tamil New Year, tragedy struck Colombo. The Meethotamulla garbage dump, on the outskirts of the city, collapsed, killing more than 30 and affecting as many as 1,800 people. Upon collapse, the garbage dump was almost 50 feet high and covered a whopping 21 acres of land. The collapse of Meethotamulla garbage dump was one of the most devastating man-made environmental events in the history of the country (Daniel, 2018). This manmade disaster had a significant impact on solid waste management in Sri Lanka.

1. Revising the existing waste management policy

Following the tragic aftermath of Meethotamulla, the Ministry of Mahaweli Development and Environment proposed a National Waste Management Policy (NWMP). Environmental Foundation Guarantee Limited (EFL) was made party to the steering committee of the NWMP by instituting a Supreme Court fundamental rights application, SC (FR) 243/ 2017, which addressed garbage dumping in environmentally sensitive areas. With the ever increasing challenge of waste management in Sri Lanka, a comprehensive policy on waste management is not only essential but, severely overdue. The final draft presented by the Ministry comprises of an overall vision, objectives, guiding principles and policy statements. The policy is well rounded in its breadth, including solid, liquid and gaseous waste, while addressing an array of sectors such as (but not limited to) municipal waste, packing waste and industrial waste. Beyond these sectors, the policy addresses knowledge management, capacity building, institutional mechanisms and means for legally enforcing the policy (EFL, n.d.).

2. Change in people's attitudes towards waste

After the disaster people have realized the importance of segregating waste to prevent a similar incident in the future. After Meethotamulla incident, communities were significantly expressing their displeasure and fear about dumping sites (D, Chathumani & Singhe etal.2019) When discussing the segregating rates, prior to the disaster it was nearly 5% and then this sky rocketed to 42%. This shows the impact the event had on the attitudes of

people. In addition, local authorities also played an important role in encouraging people to segregate waste at household level. Further confirming the change of attitudes of the community, Health Education Officer of the Dehiwela-Mount Lavinia, Municipal Council stated, “People respond positively when it comes to segregation and management. This happened mostly after the Meethotamulla Disaster. Most processes were accelerated after the disaster. We were more involved, laws were imposed and people also felt a need of managing waste. They became more sensitive to the issue. I’m telling you with my experience”. Discussing this further, Secretary of Boralesgamuwa Urban Council stated, “In every single UC, segregation exceeded 30% only after the Meethotamulla disaster. Now with the threat from Karadiyana, we have been given a target of 70%, therefore there were physical changes after the crisis”.

3. Disposal of Colombo garbage was obstructed.

After the Meethotamulla collapse the general public showed their opposition to dumping garbage. For example, there was an incident where nine garbage trucks of the Colombo Municipal Council which arrived at the dump were obstructed by the protesters. The Police Special Task Force was also dispatched for the assistance of the police as a tense situation erupted (Dias, 2017). Considering numerous court cases filed by the residents of an alternative site in Karadiyana, the district court limited the amount of solid waste that could be dumped granting permission to the municipal authorities to dump only a maximum of 350 tons of solid waste.

4. Polythene ban

Even though there were discussions about environmental concerns in the country it is important to note that Meethotamulla incident expedited the efforts of minimizing environmental harm. For example, the government imposed the ban to restrict indiscriminate use of polythene bags at groceries and retail outlets. Furthermore, sale, importation and production of polythene grocery bags, lunch sheets and shopping bags and Rigifoam items were banned from 1st September 2017 under the new regulation. Similarly, the sale, importation and production of containers, plates, cups, and spoons made using polystyrene and polythene containers used for processed or cooked meals also came under the ban (Colombo Page , 2017). In terms of polythene products, the ban on polythene

currently covers the manufacture, sale, offer for sale or free of charge exhibition and use of polythene or any product of polythene that is 20 microns or below in thickness (GN 2034/33).

Importantly, activities varying from the regular use, manufacture, sale, free distribution, exhibition, use in decorations to open burning of refuse and other combustible material inclusive of plastic (GN 2034/36) is prohibited under the current ban; rendering all the aforementioned activities punishable offences in Sri Lanka. These offenses will result in a Rs. 10,000 fine alongside two years of imprisonment.

In this regard, it is vital to reiterate the origins of the ban in Sri Lanka in the wake of the Meethotamulla garbage dump tragedy. Even as you read this, garbage is being piled up, either legally or illegally, in a landfill somewhere close to your neighborhood. Thus, the partial ban which is enforced currently ought to be considered a plausible way forward towards a complete ban on the destructive polythene bag, which is not only an action point in achieving the sustainable developmental goals as a nation, but is also vital in resolving the persisting solid waste management crisis in the island (Ranasinghe, 2018).

5. Mega polis, Western Province Solid Waste Management Authority, CEA and ITI etc. introduced new initiatives

The Aruwakkalu Waste Management Project was launched following the collapse of the Meethotamulla disposal site in 2017 as a sustainable and scientific solution to the solid waste disposal problem that has plagued many local government authorities in the country for years. The entire project costing Rs. 23 billion is scheduled to be completed by March 31 2020 (Anon., 2019).The Ministry of Megapolis and Western Development says that the Aruwakkalu solid waste management has been set up to facilitate the disposal of 600 metric tons of garbage daily in an environmentally friendly and hygienic manner.

2.9 Metro Colombo Solid Waste Management Project - Aruwakkaru Solitary land Fill

After the collapse of the Meethotamulla garbage hill on 14th April 2017 resulting in loss of lives, the government agencies are under enormous pressure to find an environmentally acceptable and sustainable solution to waste disposal in the Colombo Region (MoMWD, 2017). Therefore, in 2016, the responsibility of pursuing the proposed project was handed over to the Ministry of Megapolis and Western Development. The ministry proposed the

Metro Colombo Solid Waste Management project as a sustainable solution to the waste management crisis.

The project built a 1200 ton/day capacity semi-aerobic sanitary landfill for both organic and inorganic waste in Aruwakkalu (Puttalam district) for the disposal of municipal solid waste mainly coming from the Metro Colombo Region. According to the project plan, waste is expected to be collected at Kelaniya (MoMWD, 2007). Transportation of waste to Aruwakkalu was expected be done by train. Unfortunately, as the railway is yet to be completed the ministry resorted to transporting waste using large trucks which were rented at LKR.100,000 each per day. The project at its completion will have activities in two locations: Kelaniya and Aruwakkalu(MoMWD, 2007). In Kelaniya the Kelaniya Transfer Station (KTS) will be built. The waste will be received at this location before loading and transferring to Aruwakkalu Sanitary Landfill. At Aruwakkalu the project activities are carried out in two sites. These are the Aruwakkalu Transfer Station (ATS) and Aruwakkalu Sanitary Landfill (ASL). These two sites are very closely located.

a) Kelaniya Transfer Station: The extent of Kelaniya Transfer Station is 18 hectares approximately.
b) Aruwakkalu Transfer Station: The extent of this transfer station site is 1.3 hectares approximately.
c) Aruwakkalu Landfill Site: The extent of the proposed ASL is 47 hectares. This is an abandoned limestone quarry located almost 30 kilometer northwards of the Puttalam town (MoMWD, 2007).

3. The waste chain and related socially differentiated labor practices in Sri Lanka

As mentioned prior, the primary sources of MSW in the country are households, markets, commercial establishments while industries and hospitals constitute the secondary sources (AIT: 2004 cited in Bandara, 2011). MSW of Sri Lanka typically consists of a very high percentage of perishable organic material, which is about 65 – 66% by weight with moderate amounts of plastics and paper and low contents of metal and glass. The moisture content in MSW is also very high (in the range of 70 – 80%) on a wet weight basis. The average calorific value is low, amounting to around 600 – 1000 kcal/ kg.

Given below are some guidelines for waste chain related and socially responsible labour practices imposed by the government

- When handling bio-degradable waste and waste not containing any toxic contaminants, priorities must be given for biological processing such as composting, anaerobic digestion or any other appropriate biological processing for stabilization of waste.
- Land filling shall be encouraged to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing.
- Labour Ordinance, Factory Ordinance, other relevant regulations and guidelines stipulated by the Central Environmental Authority (CEA) approval procedures and relevant Local Authority approval procedures shall be followed. All designs shall comply with the requirements of relevant agencies
- The operator should take adequate mitigatory measures to minimize possible pollution of air, water and soil.
- Adequate training should be given to workers involved in solid waste management operations and the operator should endeavor to involve trained workers as far as possible

3.1 General procedures related to waste in Sri Lanka

3.1.1 Collection and Transportation

Waste collection is the act of picking up waste from homes, businesses, institutions, commercial, industrial plants and other locations; loading them into a collection vehicle and hauling them to a facility for further processing or transfer to a disposal site. Collection of wastes is one of the basic elements of any waste management system. However there exists a difficulty in collection of un-separated (commingled) and separated solid waste in urban areas because the generation of waste takes place in every house, every apartment building and commercial and individual facility as well as in the streets, parks, and even in vacant areas. Therefore, in any waste collection operation it is important to look into the types of waste collection services/systems, type of equipment used and associated labour requirements, collection routes etc.

3.1.2 Transfer Stations

After collecting waste, it has to be transported into either a material recovery facility/further-processing facility or a landfill facility. Transfer refers to the act of transferring waste from collection vehicles to larger transport vehicles. A transfer station is necessary to transfer waste from smaller collection vehicles to larger transport vehicles in order to be moved to a processing facility or a disposal area, usually landfills. In some transfer operations, compaction or separation may be done at the station.

3.1.3 Material Recovery Facility

Material recovery and further processing is one of the functional elements of a waste management system. Material recovery facility is a physical facility used for further separation and processing of wastes that have been separated at the source and for the separation of mixed wastes. Processing at a material recovery facility may include separation of bulky items, separation of waste components by size using screens, manual separation of waste components, size reduction by shredding, separation of ferrous metals using magnets, and volume reduction by compaction and combustion. Material recovery is the only way to complete recycling after wastes are separated. However, materials can be recovered from waste that have not been separated at the source.

3.1.4 Incineration Facility

Incineration is a controlled process by which solid, liquid, or gaseous combustible wastes are burned and changed into gases, and the residue produced contains little or no combustible materials. Incineration without adequate control systems leads to the release of gases which cause air pollution. Thus, suitable precautions should be taken to minimize resulting air pollution. Incineration of Residue- Derived Fuel [RDF], i.e. materials remaining after the selected recyclable and noncombustible materials that have been removed from MSW, can be given attention when limited land is available for land filling of such materials.

3.1.5 Composting Facility

Composting is the controlled biological decomposition of organic solid waste materials under aerobic conditions. Compost can be used as a soil conditioner. In general, the chemical and physical characteristics of compost vary according to the nature of starting material, the conditions under which the composting operation was carried out, and the extent of decomposition. In Sri Lanka it is said that most solid wastes contain biodegradable materials and are therefore suitable for composting. Therefore, composting can be a more viable option and this should be given serious attention by waste management organizations. It should be noted that the quality of compost depends mostly on the degree of contamination and the type of organic waste. Segregation of waste at the source plays an important role in the production of better quality compost.

3.1.6 Anaerobic Digestion / Biogas Production Facility

Highly organic waste has a potential to produce biogas as a source of energy for lighting and heating while producing compost after digestion. Here the production of methane [bio-gas] from solid waste takes place by anaerobic digestion/anaerobic fermentation. Utilization of biogas for the disposal of highly organic waste can also be considered as a strategy for the disposal of highly organic waste.

3.1.7. Landfill Facility

Although source reduction, reuse and recycling can divert a large portion of Municipal Solid Waste (MSW) from disposal, some waste is continuously dumped in landfills. Landfills should be properly engineered facilities that are located, designed, operated, monitored, closed, and cared for after closure to ensure minimal impacts on environment and human health. Preferably, landfilling should be for non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing.

Many newspaper articles have addressed the garbage issue in the streets of Colombo. In terms of garbage dumping in the selected locations, the Karadiyana site is currently the functional open dumping site. The Karadiyana Landfill is located approximately 2 km from Ratmalana Airport and 15 km from central Colombo. Situated in the Thumbovila area of the Kesbewa divisional secretariat in a 25 acres land. At present, the Karadiyana landfill receives waste from as many as 8 Local Authorities and some of this waste is used to produce compost while most is disposed in the open dump.

50MT of waste is dumped to the Karadiyana land per day and approximately 230 waste loaded vehicles arrive. The center charges SLRs.500 per MT from the LAs for its dumping service, and an ad-hoc service charge based on the volume from any private person or organization that dumps their waste into the site. Daily collection of waste is pushed into 6 lots while removing the non-biodegradable and recyclable waste from it. After three months of composting, the contents are packed as organic fertilizer for selling while the remaining big particles should be crushed and made in to powder form compost. The recyclables collected by the waste are stored and are sold to third party waste collectors. The main function of the Karadiana center is composting.

3.2 Waste practices of men and women at the household level and by institutional waste producers

A study titled 'Solid Waste Generation, Characteristics and Management within the Households in Sri Lankan Urban Areas' was conducted based on the Gampola UC area. This study shows that waste generation differs when the economic level of the waste generators varies (Wijerathna et al. 2013). The study further reveals that when the income level of individuals is high, the waste generation amount is higher as well.

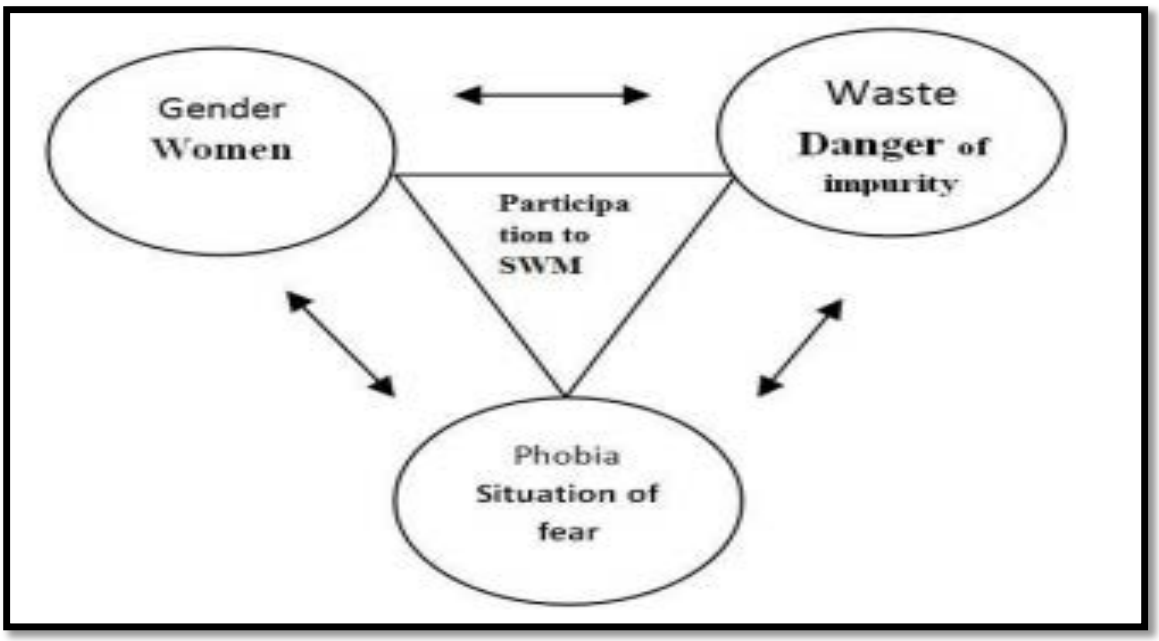
In relation to waste management at the domestic level, the study points out that many of the households with larger land areas dispose waste in their own back yard. A significant proportion of the dumped waste is kitchen waste compared to other types. Many people reuse polythene, ragged clothes and plastics for household purposes and some people use coconut shells, polythene, paper and cardboards to fire up the hearth of the kitchen. Some of them use egg shells and used tea leaves as plant feedings. Therefore, only a very little amount of waste remained (Wijerathna et al. 2013). Most of the used glass bottles and recycled, private vendors purchase the excess from the households. The study also reveals that another common method used to manage waste at the domestic level is burning the waste. Very few among these households perform home composting using home composting bins or methods like the pit method and the piling method.

The study titled 'Gender perspective of community participation in solid waste management; a case of Balangoda urban council, Sri Lanka', focuses on the gendered aspect of community participation in SWM. It incorporates the ideas of Bell (1997) who states that it is a common feature that women have a close relationship with the environment in most developing countries. It elaborates on the social construction of gender roles in Sri Lanka, where women are responsible of making the home and its surroundings clean. This, coupled with the fact that waste management is primarily dependent on the notion of cleaning, emphasize the pivotal role played by women in waste management Household waste management is often the unpaid work of women, but when it is mechanized (in the delivery cycle) it is paid. It continues to expound on the fact that in developing countries individuals carry out a large proportion of waste management including collecting, sorting, recycling and even selling. As per the study, activities such as selling sorted garbage are apparent only in very low income households (Laven V.Z.& Sriwardena N, 2000 cited in Vineeshiya & Mahees, 2016). Women are more likely to be involved in daily contact with the waste in their

homes. Perhaps, this is because women tend to be among the most marginalized groups of some societies. The authors state that women generally portray a more significant level of participation in the waste management process compared to males.

Considering the second component of the study, findings reveal that female awareness of waste management is higher than males. The findings are thereby linked to Vandana Shiva's (1989) ideas that women naturally think of the next generation, and that these responsibilities make women more environmentally friendly than men.

Figure 4: Model of Gender waste Phobia



Source: Vineeshiya & Mahees, 2016

According to a study titled 'Involvement of Women in Municipal Solid Waste Composting in Sri Lanka' (2017) women who are involved as waste workers face several issues such as lack of recognition, inadequate resources and welfare facilities, political influences, lack of training, health and family related problems (Sinnathamby, et al., 2017). The study further states that due to unfavorable working conditions, women tend to more frequently dropout from their job. According to the study, these workers have low interest to proceed with their job due to lack of career options as well as health and safety related problems (Sinnathamby, et al., 2017).

Identifying the reasons for this occurrence, the authors state that Kitchen waste is the main type of solid waste in poor households. As women are responsible for handling the kitchen

one can identify women in underserved communities as the most significant actor in waste management in underserved communities.

In terms of waste management in restaurants, a newspaper article reveals that garbage disposer units are used for waste management, which can also be used at household level. This garbage disposer unit eases the hassle of collecting and disposing food waste in residential and commercial establishments. This unit grinds nearly all types of food waste including chicken bones, eggshells and fruit and vegetable peel.

On the other hand, a study titled 'Recommendations through a Complete Study on Healthcare Solid Waste Management Practices of Government Hospitals in Colombo, Sri Lanka' discusses the waste management process in health care institutions such as hospitals. In this study, it has been revealed that, two hospitals out of the eight investigated (25%) separate all healthcare waste into seven categories namely general, pathogenic, infectious, sharps, radioactive, recyclable, and other wastes, and only two hospitals (25%) generate radioactive wastes. Another six hospitals out of the eight investigated (75%) separate their healthcare waste into five categories.

4. Accompanying discourses on waste and waste-work in Sri Lanka.

4.1. Theoretical stance

The present study uses Michel Foucault's notions on social discourse to understand the MSWM in Sri Lanka. For Foucault, a discourse is an institutionalized way of speaking or writing about reality. It defines what can be intelligibly thought and said about social world and what cannot. At any given time there is one dominant discourse developed by a dominant social force. This social force can be an expert, a dominant agency in a given field, a charismatic person etc. These dominant actors decide what is correct and what is appropriate. Number of such actors determines the discourse on municipal solid waste management in Sri Lanka. These includes the experts trained in developed world, foreign agencies and international non-governmental organization.

Touching on these Jayasinghe (2015) studies the informal waste collection in Sri Lanka. According to Jayasinghe all the MSWM stakeholders operate within a *wastes cape* in other words a dominant expert system. This dominant system has a monopoly over the science of waste management. Organizations such as the Japan International Cooperation Agency, Korea International Cooperation Agency, the United Nations Organization and its affiliates

as well as internationally trained practitioners and academics belong to this expert category. The government and other decision makers generally consult such agencies and experts when seeking recommendations. He reveals that both decision makers and expert systems are inclined to adopt tactics used by developed countries when formulating solutions for Sri Lanka. Imitation of waste management tactics used in the developed countries poses a question wether these methods are applicable to Sri Lanka. Perera (2007 cited in Jayasinghe, 2015) states that such acts of 'blindly copying the North' have not only led to the failure of many development projects but also caused significant failures in waste management.

4.2 Open dumping sites

Open dumping is the main waste disposal method in Sri Lanka. After a landslide at the Meethotamulla open dumping site in 2017 serious opposition has emerged from the Sri Lankan society against open dumping. However, upon scrutiny literature reveal that this protest is not against the method of open dumping but rather against construction and maintaining a dumping site in the immediate neighbourhood of the protestors. All the protests that took place in the aftermath of Meethotamulla landslide demanded the government to either to stop dumping MSW from other municipalities or to relocate the dumping site elsewhere.

For an instance on 20th of April, 2020 immediately after the Meethotamulla disaster the residents of Karadiyana demonstrated against the dumping of waste. They blocked 20 tractors that carried MSW of Colombo Municipal Council. The protestors demanded the government to stop dumping MSW of Colombo Municipal council at Karadiyana dumping site. One protestor stated "*We are fine with our own garbage from Kesbewa and Boralesgamuwa being taken to Karadiyana but we oppose any garbage from outside*" (Imitiaz 2017, p 07).

Rajendra (2017) identifies this relaxed attitude public have on open dumping as a major factor that backs large scale open dumping by referring to the findings of Vidanaarachchi et al. (2006) where 81% of the sample said that they are happy with the current waste disposal system. According to him this relaxed attitude, emerge from the "*lack of information regarding the impact of the practice. Alternately, it may stem from a 'societal addiction' to a knowingly harmful practice based on the immediate benefit of cheap and easy disposal* "(Rajendra, P.02). He suggests that in order to change this attitude the government should

adopt landfill taxes; community engagement strategies for composting and waste segregation. Community engagement in deliberative democratic discourse can shift paradigms towards reduced waste production by providing a vessel for shared among the community members.

4.3 Technologies of government are in place to control these practices

Employment of officers to supervise improper waste disposal

As indicated in an article in March 2018, The Colombo Municipal Council has taken steps to deploy civil police officers in order to arrest persons who wrongly dispose of garbage. The officials were to be deployed from 4 AM to 7 AM within the Colombo Municipal Council limits, Borella, Slave Island and other places identified as areas where garbage was not disposed in the correct manner. The Acting Municipal Council Commissioner said this measure was taken due to an increase in unsegregated garbage. Further, a newspaper article further noted that the Army, the Environmental Police and the Colombo Municipal Council were conducting raids in the city of Colombo to nab those who dispose garbage in an improper manner. Further, in June 2017, Army Spokesperson, Brigadier Roshan Seneviratne, said that to monitor the disposal of garbage in Colombo they plan to establish a separate monitoring unit. The Colombo Municipal Council has taken legal action against 150 individuals for the alleged improper disposal of garbage in the city of Colombo as cited in an article in 2017. Government levied a fine of five thousand rupees from 20 individuals and while giving others a stern warning.

Installation of CCTV cameras for surveillance

Further, the Ministry of Local Government and Provincial Councils had taken steps in 2017 to install CCTV cameras for administrative purposes such as monitoring the flow of vehicles, weighing of the trucks etc. The pilot project intends to cover the open dumping sites and their immediate neighbourhood with CCTV cameras.

Installation of GPS technology on garbage trucks

Further, due to multiple complaints on ‘Garbage Collectors’ engaging in “other activities” such as using MC equipment to transport building materials, construction waste etc. resulting in garbage collection being delayed, it was proposed that Garbage trucks be

tracked by GPS technology in 2017. In order to implement this proposal, an agreement was signed with a technical institute for the installation of GPS trackers on the vehicles.

The Minuwangoda Urban Council (MUC) together with the Western Provincial Council (WPC) launched a mobile app in a bid to streamline the garbage collection process in the local government area with the aim of developing a communicative digital platform between residents and officials (Daily Mirror, 2019).

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ANNEXURES

Meethotamulla: open garbage dumping site – History and Crisis

The Pothuvila Paddy Field

In the current location of the Meethotamulla garbage mountain once stood a paddy field called Pothuvila, administered by the local Agrarian Services Centre. It had been integral to the livelihoods of villagers in Kolonnawa, with a community of residents subsisting from its produce. However, with the opening of the economy in 1977, farmers found it difficult to compete with the prices of imported rice, and eventually, the Pothuvila farm was abandoned (Rivishan, 2017).

Local residents trace their earliest memories of the residential grid that has replaced the Pothuvila farm to the 1970s. As the Colombo District swelled with the influx of economic migrants from rural areas, the land was soon filled with occupants, both legal and illegal. By mid-1980s, the land also proved convenient for the Kolonnawa Urban Council (KUC) to dump the garbage collected within its jurisdiction.

Gam Udawa and The National Housing Scheme

In 1989, Meethotamulla was chosen for then President Ranasinghe Premadasa's *Gam Udawa* (Village Awakening) programme. Remembered as one of the most ambitious urbanization programmes undertaken by the government, the *Gam Udawa* programme's purpose was to alleviate the living conditions of suburbs and rural areas by creating townships with comprehensive infrastructure systems. Part of the community at the Pothuvila farm were formalized into a model village called Dahampura, and its residents were given legal title deeds for their land. Another group of the residents were absorbed into the national housing scheme of Pansalhena (Ismail, 2017). However, there remains to this day a portion of dwellers in the area who belong to neither community, and who do not hold legal titles for their land.

Dumping garbage

Dumping of garbage in the Meethotamulla site began 30 years ago. The garbage came from Kolonnawa, Kotikawaththa and Mulleriyawa. A significant amount of garbage was dumped daily at the site, amounting to 800 tons at the 20 acre landfill. The dump stood at around

300 feet / 91 meters high. However, the Meetotamulla garbage dump has grown up to 17-20 acres, and it is said that the height of the garbage mountain was closer to 20 meters. (Rivishan, 2019)

The Meethotamulla garbage dump, located in Potuwilkumbura, was a small-scale dump garbage site for the Mulleriyawa and Kolonnawa provincial councils. Following the shifting of Blue Mandel Garbage dump, garbage collected from the Colombo municipal council was also dumped to the Meethotamulla garbage dump. (Rivishan, 2019) Eight Grama Niladari divisions including Sedawatta, Welewatta, Kotuwila, Kuruniyawatta, Kittampahuwa, Weheragoda, Wennawatta, and Halmulla surrounds the Meethotamulla garbage dump. There were about 5,000 families who resided in the area and about a 20,000 general population lived in the vicinity of the garbage dumping area.

The Meethotamulla garbage site collapsed on Friday, 14th of April 2017 when Sri Lanka was preparing to celebrate the dawn of another Sinhala and Tamil New Year. This occurred at around 3pm, causing much damage to houses and burying a number of people under debris (Fernando, 2017). The damage was not limited to the site itself, but also affected surrounding areas including Nagahamulla, Dahampura and Visithune watta. The unexpected occurrence gained the attention of many Sri Lankans, with the police, security personnel and people in the areas immediately rushing to the scene and engaging in rescue efforts. It is said that the site collapsed many times, making it even more difficult to reach those trapped under rubble. The death toll was 32 with close to 625 people been affected including 180 families. Immediately after the incident, on 16th April, The National Building Research Organization (NBRO) called for the evacuation of people living in 130 homes surrounding the dump labelling the location as a danger zone. Certain families were evicted from the area as many houses were in the ‘danger zone’ (Fernando, 2017).

Movement against garbage dumping

The movement that had been agitating against the growing dump site formalised into the People’s Movement Against the Meethotamulla, Kolonnawa Garbage Dump (PMMKGD), and staged multiple protests. In the resulting legal dispute, the Supreme Court ordered garbage to be deposited in Meethotamulla as a temporary measure and declared an area of two acres for the purpose. However, the same formula of bureaucratic negligence that

operated in Bloemendhal was seen here and the dump grew, covering over 21 acres and reaching up to 300 feet. Journalists reported of an economic subsystem of scavengers and tender profiteers who depended on the garbage dump while residents suffered.

As Kolonnawa is veined by the Kittampahuwa Ela, one of the waterways connected to the Kelani River, Meethotamulla is prone to periodic flooding during the monsoons. The floods carried the ooze of black sludge from the garbage dump across households and caused further misery. The Rajapaksa regime relocated some of the unauthorized dwellers in the area to the nearby housing scheme, Sudu Nelumpura, and offered Rs. 1.5 million as an incentive for others to find alternative housing. However, most residents affected by the dump declined the money as it inadequately compensated for their loss and they saw no reason to forfeit their legal title.

The PMMKGD continued to battle the authorities legally, filing Fundamental Rights cases and staging protests. Both the Rajapaksa regime and the current government responded to these protests with either suppression or neglect. The police forcibly dispersed demonstrations and water-cannoned marches. There were instances where unidentified group of thugs attacked PMMKGD protests and in an inversion of justice now familiar to Kolonnawa, members of the PMMKGD were arrested. On April 7, 2016, parliamentarian S.M. Marikkar questioned why no solution had been devised for the Meethotamulla garbage dump issue. Deputy Minister of Megapolis and Western Development Lasantha Alagiyawanna stated the following. "There were objections raised against the proposal to take garbage to Puttalam. We have now given our attention to an alternative solution… we are carrying out a tender process of selecting new organisations [to solve the problem]." When Marikkar pressed Parliament to give an explanation as to why the Government had been inactive though the tenders were received a year ago, the Deputy Minister Alagiyawanna replied: *"First we only take the proposal. We have finished taking that proposal. We have now given those who gave proposals the opportunity to provide financial and feasibility plans."* Earlier, in March that year, the methane emissions of the Meethotamulla garbage dump reacted with the extreme heat and caused a fire.

"This was a gold mine for the politicians in the past. The Colombo Municipal Council awarded a tender worth Rs. 600 million at Rs. 800 million and made sure the other Rs. 200 million went into the pockets of the politicians." – Attorney At Law Nuwan Bopage (Chairperson – People's Movement Against the Kollonnawa Garbage Dump) Adding to this

idea, he claimed that garbage is being dumped using lorries belonging to the Mayor of Kollonnawa, Deputy Mayor and Councilors in the opposition. “They made this a method of income.,” he added. Stressing this point further, he claims “Our children have been buried by this same garbage, over 60 families are under the debris. The politicians who created this mountain of garbage used it for petty political gains.”

The people’s movement, which hoped to stop dumping at Meethotamulla, also said that the Prime Minister Ranil Wickramasinghe invited them in February 2015. During the meeting, the Premier had promised a solution within 6 months. The movement critically added that though the election was won following the six months, there was no solution to-date, except for the adverse effects caused by the collapse.

Showing strong opposition to the politicians who failed to take any action about the Meethotamulla garbage site, which was expanding with time, a member of the Peoples Movement against the Kollonnawa Garbage Dump, expressed the following views. “Mahinda Rajapaksa, Gotabhaya Rajapaksa and Ranil Wickremesinghe all these people should be sent to prison on charges of murder. They have to be given the death penalty. All the politicians who did not take any action while we were suffering for 6 years should resign. We did not come and settle near this garbage dump. They put the garbage where we lived.”

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Aruwakkalu Sanitary Land fill

The Aruwakkalu Waste Management Project was launched following the collapse of the Meethotamulla disposal site in 2017 as a sustainable and scientific solution to the solid waste disposal problem. And this was a decision first taken by the then government in 2014. And the entire project costing Rs. 23 billion is scheduled to be completed by March 31 ,2020.

Prior to this, several failed attempts were made in to implement such a landfill. For example, in 1997, the government attempted to establish a landfill in Meepe with World Bank funding, but the project was stalled due to public protests and opposition. And the same repeated in 2007.

Aruwakkalu landfill site which is located in the North Western Province, about 30 Km north of Puttalam town, lies east of the fishing village of Gangewadiya and south of the, Kala Oya mouth. The site has many abandoned lime stone quarries used by the former Cement Corporation of Sri Lanka (now leased out to Holcim Lanka) about 20 years back. The project site for landfill forms a roughly rectangular area, with dimensions of 1.2km (north/south) by 0.4km. The total extent of the land area is 30 ha. (MINISTRY OF URBAN DEVELOPMENT, 2015)

It was proposed to transport the garbage to the Aruwakkalu area of Puttalam in the North Western Province through the Kelaniya Transfer Station (KTS). Then the is waste subjected to high pressure at the KTS and then it is transported by train to Aruwakkalu site that have a distance of nearly 160 km by rail from Kelaniya. However, currently the garbage is transported directly to Karadiyana through trucks and lorries.(Bohram, 2017)

The government has spent Rs. 23 billion which is the largest scientific waste disposal facility built in Sri Lanka with a capacity of 600 metric ton of garbage. The Government intends to use this facility at least for 30 years. Depending on the total capacity of the facility, 1200 metric tons can be disposed per day. The project is extended over 2 square kilometers.

In 2015, Environmental Impact Assessment (EIA) had been carried out to check the environmental consequences that may arise from the implementation of the project. The proposed project area and an area that covers 500 m radius around the boundary of the proposed site was considered for the ecological and physical impact studies (air, water, noise and vibration).

The site is located within the 1mile (1.609 km) Buffer Zone of the Wilpattu National Park (WNP). The Wilpattu wetland cluster extending beyond the boundaries of the National Park is listed under the Ramsar Convention for Conservation of Migratory Wetland Birds, as Sri Lanka‟s 6th Ramsar site. The Kala Oya / Lunu Oya Estuary which supports the largest, richest, and the most pristine mangrove patch in Sri Lanka is 200 m north east from the landfill site.

Sociologist Nimal Premathilaka, who was in charge of the Aruwakkalu project, had carried out social; impact assessment considering the entire grama niladhari division in 2015. (Ministry of Urban Development, 2015)

According to the former Ministry Secretary Rupasinghe ; the facility will not charge any train transport expenses and the government will bear the cost of transport until March next year. To maintain the facility after March 2020, the cabinet has appointed a committee to decide on how to charge for the expenses.

Dumping of garbage at Aruwakkalu first started in August 2109, however, the Wanathawilluwa Pradeshiya Sabha protested saying that they will not permit unprocessed and non-chemicalized waste to be dumped at the site. In addition, many trucks and Lorries, which transport garabage to Aruwakkalu, was attacked multiple times. Nevertheless, Wanathawilluwa Pradeshiya Sabha had requested for a monthly fee of Rs. 2.5 million. In October this year, an explosion in a drainage tank in the Aruvakkalu garbage landfill was reported. Amidst of all these the sustainability of this project is uncertain.

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